



NEW ZEALAND



EDICT OF GOVERNMENT



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NZS 5823 (2005) (English): Specification for
buoyancy aids and marine safety harnesses and lines
[By Authority of New Zealand Lake Taupo Navigation
Safety Bylaw 2010 (SR 2010/363)]

*We will sell to no man,
we will not deny or defer to any man either justice or right.*

Magna Carta—Tūtohunga Nui

*Kore rawa e hoko ki te tangata, e kore e whakakāhoretia,
e tautuku rānei te tangata ki te ture, tika ranei.*



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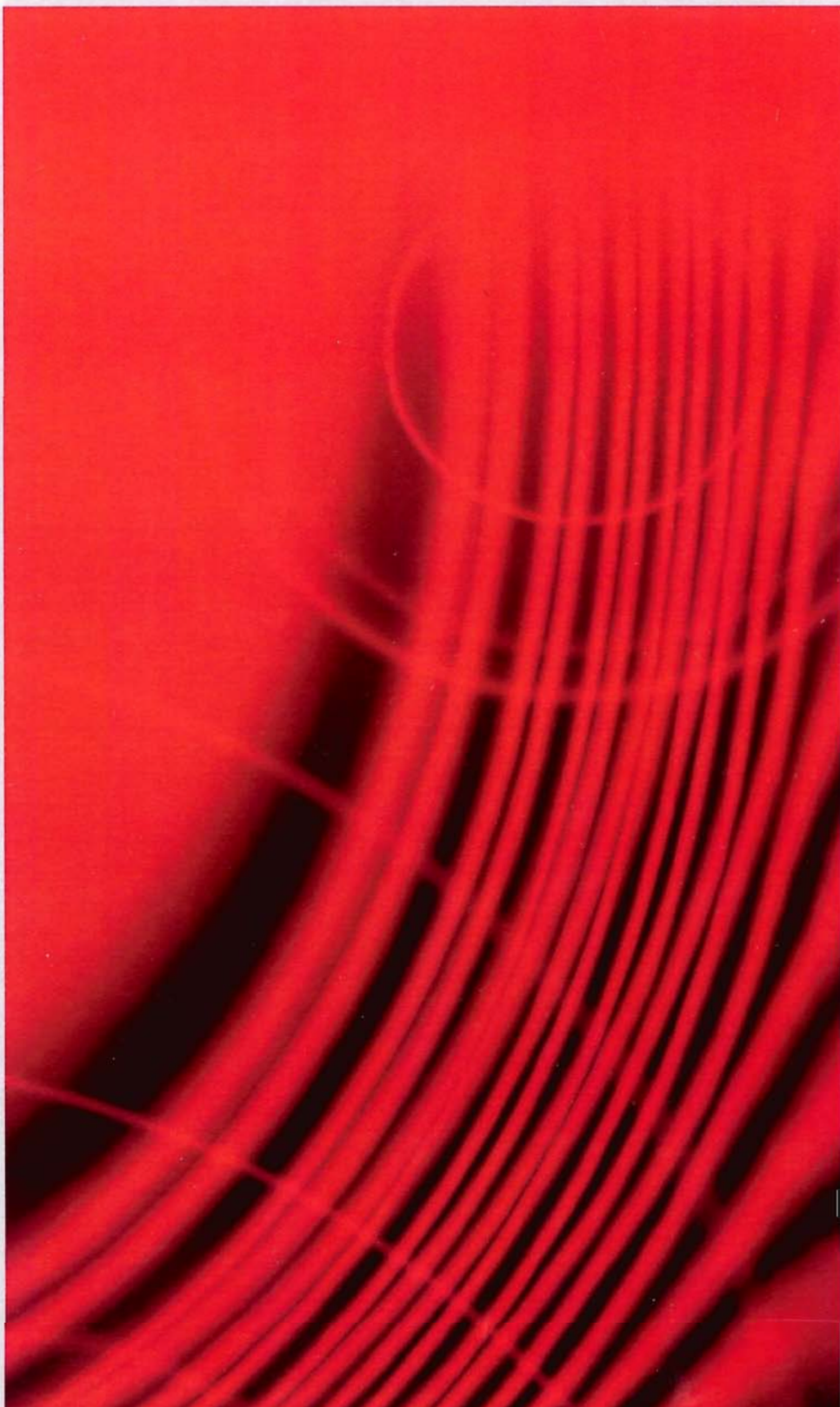


New Zealand Standard

Specification for Buoyancy Aids and Marine Safety Harnesses and Lines

Superseding NZS 5823:2001

NZS 5823:2005



COMMITTEE REPRESENTATION

This Standard was prepared under the supervision of the Buoyancy Aids and Marine Safety Harnesses and Lines Committee (P 5823) for the Standards Council, established under the Standards Act 1988.

The committee consisted of representatives of the following:

Bureau Veritas NZ Ltd
Coastguard New Zealand
Hutchwilco Ltd
Maritime Safety Authority of New Zealand
RFD New Zealand Ltd
Rhumbline Ltd
Safety at Sea (Australasia) Ltd
Water Safety New Zealand

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REFERENCED DOCUMENTS

Reference is made in this document to the following:

NEW ZEALAND STANDARD

NZS 5432:1990 Webbing for restraining devices for occupants of motor vehicles

AMERICAN STANDARDS

ASTM C 177 – 04 Standard test method for steady-state heat flux measurements and thermal transmission properties by means of the guarded-hot-plate apparatus

ASTM C 518 – 04 Standard test method for steady-state thermal transmission properties by means of the heat flow meter apparatus

ASTM D 3574 – 03 Standard test methods of testing for flexible cellular materials – Slab, bonded, and moulded urethane foams
Test F – Tear resistance test

AUSTRALIAN STANDARDS

AS 1192:2004 Electroplated coatings – Nickel and chromium

AS 1753:1990 Webbing for restraining devices for occupants of motor vehicles

AS 1789:2003 Electroplated coatings – Zinc on iron or steel

AS 2001: - - - - Methods of test for textiles
Part 1:1995 Conditioning procedures
Part 2.10:1986 Physical test – Determination of the tear resistance of woven textile fabrics by the wing-rip method
Part 4.E02:2001 Methods of test for textiles – Colour fastness tests – Colour fastness to sea water
Part 4:- - - - Colour fastness tests
Method 4.21 Determination of colour fastness to light using an artificial light source (mercury vapour, tungsten filament, internally phosphor-coated lamp)

AS 2193:2002 Calibration and classification of force-measuring systems

AS 2259:1996 General requirements for buoyancy aids

AS 2332:2003 Slide fasteners

AS 4142:- - - - Fibre ropes
Part 1:1993 Care and safe usage
Part 2:1993 Three-strand hawser-laid and eight-strand plaited

AS 4143:- - - - Methods of test for fibre ropes
Part 1:1993 Dimensions, linear density, breaking force and elongation

BRITISH STANDARDS

BS 381C: 1996	Colours for identification, coding and special purposes
BS EN ISO 2411:2000	Rubber or plastics-coated fabrics. Determination of coating adhesion
BS EN ISO 4674.1:2003	Rubber- or plastics-coated fabrics. Determination of tear resistance. Constant rate of tear methods
BS 2782:- - - - Part 3:- - - -	Methods of testing plastics Mechanical properties Methods 320A to 320F:1976 Tensile strength, elongation and elastic modulus (under review)
BS 3146:- - - - Part 1:1974 Part 2:1975	Investment castings in metal Carbon and low alloy steels Corrosion and heat resisting steels, nickel and cobalt base alloys
BS 3424:- - - - Part 5:1982	Testing coated fabrics Methods 7A, 7B and 7C. Methods for determination of tear strength (Part 5 is now partially replaced by BS EN ISO 4674.1:2003 Rubber- or plastics-coated fabrics. Determination of tear resistance. Constant rate of tear methods
Part 12:1996 Part 22:1983	Testing coated fabrics. Accelerated ageing process Method 25. Methods for determination of fusion of PVC coatings and the state of cure of vulcanized rubber coatings
BS 3870:- - - - Part 1:1991	Stitches and seams Classification and terminology of stitch types
BS EN 12373.1:2001	Aluminium and aluminium alloys. Anodizing. Method for specifying decorative and protective anodic oxidation coatings on aluminium

ISO STANDARDS

ISO 2411:2000	Rubber – or plastics-coated fabrics – Determination of coating adhesion
ISO 7854:1995	Rubber – or plastics-coated fabrics – Determination of resistance to damage by flexing
ISO 9227:1990	Corrosion tests in artificial atmospheres – Salt spray tests

NEW ZEALAND LEGISLATION

Maritime Rules made under the Maritime Transport Act 1994

OTHER PUBLICATIONS

CIE publication 39.2:1983 Recommendations for surface colours for visual signalling

International Maritime Organization Resolution A.658(16)
20 November 1989, Annex, Type I and Type II Classification

LATEST REVISIONS

The users of this Standard should ensure that their copies of the above-mentioned New Zealand Standards and referenced overseas Standards are the latest revisions or include the latest amendments. Such amendments are listed in the annual Standards New Zealand *Catalogue* which is supplemented by lists contained in the monthly magazine *Standards Update* issued free of charge to committee and subscribing members of Standards New Zealand.

REVIEW OF STANDARDS

Suggestions for improvement of this Standard will be welcomed. They should be sent to the Chief Executive, Standards New Zealand, Private Bag 2439, Wellington 6020.

FOREWORD

This Standard is a revision of NZS 5823:2001 *Specification for buoyancy aids and marine safety harnesses and lines*. All Standards are revised periodically as the need arises. This revision was initiated in response to concerns being raised in the sector that existing buoyancy aids were not always accompanied by enough information to ensure purchasers were able to select the most appropriate device for their intended use. In addition, this provided an opportunity to consider other international improvements and changes in the production of buoyancy aids, safety harnesses and lines. These included:

- Significant changes to the labelling requirements and the information required on swing tags – specifically in relation to what a jacket will or will-not do, as well as fitting and sizing instructions (including chest size in addition to weight);
- The ability to attach crotch straps to adult buoyancy aids accompanied by a recommendation that using these will reduce the risk of jackets riding up;
- That in-shore waters lifejackets (402s) should no longer be referred to as life jackets, but as personal flotation devices (PFDs), and should also carry appropriate warnings.

Also included was formalizing the current certification requirement to include 10 % more buoyancy material than specified, as a quality assurance buffer to compensate for variance in inherent buoyancy material batch consistency.

This Standard is intended to serve as a guide to manufacturers, purchasers and users of such safety equipment in ensuring that the equipment provides an effective standard of performance in use. Equally essential is the need for the designer to encourage the wearing of the equipment by making it comfortable and attractive for continuous wear, either on or near water, rather than for it to be stowed in a locker for emergency use.

This Standard provides a means of classifying the different types of buoyancy aids, and sets out minimum buoyancy requirements for each type of aid. Both the buoyancy and the classification are required to be marked on each type of buoyancy aid. In this way the consumer will be able to identify the required buoyancy aid. For instance, if a buoyancy aid is marked, 'IN-SHORE WATERS PERSONAL FLOTATION DEVICE', the user will know that this is an aid for persons who anticipate an early rescue, and need an aid to help maintain a safe floating position.

Also included in this Standard is a specification for marine safety harnesses and safety lines. Both a child's and an adult's size are specified, with a performance test using a specified dummy for each.

This Standard is based on Australian, European and CEN (European Committee for Standardization) Standards.

This revision highlighted an issue in relation to the use of buoyancy devices by kayakers. Kayaking buoyancy aids are often produced by specialist manufactures to meet the specific needs of the wide range of water environments utilized by kayakers. As a consequence, manufacturers are not always able to produce these devices in compliance with the current requirements of NZS 5823 – due to a number of factors including colour, design and buoyancy specifications. The specialist personal flotation devices section (406) has been amended to address these issues.

The Maritime Safety Authority of New Zealand has also recognized this issue and is working with the kayaking industry to put a solution in place.

In recognition of the significant changes between this edition of NZS 5823 and the previous, a transition period of six months from the public availability of this document is required to allow manufacturers and testing authorities to update their processes in order to meet compliance requirements.

NZS 5823:2001 (superseded) will remain current until the end of 2005.

NOTES

NEW ZEALAND STANDARD

SPECIFICATION FOR BUOYANCY AIDS AND MARINE SAFETY HARNESSSES AND LINES

PART 1 GENERAL

101 SCOPE AND APPLICATION

101.1 Scope

This Standard sets out general and specific requirements for the following types of buoyancy aids for surface water use, such as boating, kayaking and water skiing. The Standard does not provide for lifejackets, personal flotation devices, buoyancy vests, garments and wetsuits for persons under 10 kgs, nor does the Standard cover buoyancy aids for divers.

The following are covered:

- (a) Open-waters lifejackets for use in open-waters;
- (b) In-shore waters personal flotation devices for use in in-shore waters;
- (c) Buoyancy vests;
- (d) Buoyancy-aid wet suits;
- (e) Buoyancy garments;
- (h) Specialist personal flotation devices;
- (f) Rescue buoys;
- (g) Float-off buoyancy aids.

In addition, the Standard covers a selection of the various buoyancy aids and their care.

101.2

This Standard also sets out requirements for safety harnesses and lines for use by yacht and boat users. It specifies general design requirements, constructional requirements, test methods and requirements for individual components, together with a performance test for the finished article.

101.3 Interpretation

The word “shall” identifies a mandatory requirement for compliance with this Standard. The word “should” refers to practices which are advised or recommended.

101.3.1 *Commentary clauses*

Clauses prefixed by “C ” and printed in italic type, within a shaded grey box, are intended as comments on the corresponding mandatory clauses. They are not to be taken as the only or complete interpretation of the corresponding clause nor should they be used for determining in any way the mandatory requirements of compliance within this Standard. The Standard can be complied with if the comment is ignored.

101.3.2 Appendix

The terms "Normative" and "Informative" have been used in this Standard to define the application of the Appendix to which they apply. A "Normative" Appendix is an integral part of a Standard, whereas an "Informative" Appendix is only for information and guidance. Informative provisions do not form part of the mandatory requirements of the Standard.

101.3.3 Referenced documents

The full titles of referenced documents cited in this Standard are given in the list of Referenced Documents immediately preceding the Foreword.

102 DEFINITIONS

102.1

For the purpose of this Standard the following definitions shall apply:

BECKET – A device suitable for gripping by hand.

NOTE – The becket is not intended for lifting purposes.

BUOYANCY AID – Any device designed to assist a person to remain afloat in water until rescue is effected. Categories of buoyancy aids covered in this Standard are as follows:

401/OPEN-WATERS LIFEJACKET (PREVIOUSLY REFERRED TO AS COASTAL LIFEJACKET) – A buoyancy aid worn on the body which is intended to maintain the wearer in a safe floating position and for use in rougher waters, instead of an in-shore waters personal flotation device. It may incorporate provisions for protection against hypothermia.

402/IN-SHORE WATERS PERSONAL Flotation DEVICE (PFD) (PREVIOUSLY KNOWN AS IN-SHORE WATERS LIFEJACKET) – A buoyancy aid worn on the body which is intended to maintain the wearer in a safe floating position and for use in in-shore waters where early rescue may be anticipated. Personal flotation devices may incorporate provisions for protection against hypothermia.

403/BUOYANCY VEST – A buoyancy aid worn on the body and intended for use in aquatic sports, to assist in flotation during short-term immersion in smooth waters.

404/BUOYANCY-AID WET SUIT – A wet suit with added buoyancy intended for use in aquatic sports where hypothermia and frequent immersion in the water may place the wearer at risk.

405/BUOYANCY GARMENT – A buoyancy aid, other than a lifejacket, personal flotation device or buoyancy vest, worn on the body and intended for use when the wearer is at risk of immersion in water.

406/SPECIALIST PERSONAL Flotation DEVICE (PFD) – A buoyancy aid worn on the body intended to maintain the wearer in a safe floating position when he or she experiences severe conditions in specific aquatic pursuits (e.g. white-water rafting, jet and power boat racing, kayaking).

501/RESCUE BUOY – buoys intended to be thrown or dropped to a person in water to assist in effecting rescue, this does not apply to lifebuoys required to be carried by commercial vessels.

601/FLOAT-OFF BUOYANCY AID – A buoyancy aid for use in a boat and to be available to provide additional buoyancy should the boat sink.

CONTINUOUS WEBBING SLIP – Slippage in excess of 25 mm.

CONTROLLING BODY – A body responsible for the preparation or implementation of rules for aquatic sports or both.

PRIMARY STRAPS AND COMPONENTS – Straps or components that take the majority or full load in the event of a fall.

NOTE – In order to differentiate between primary and secondary straps and components, where there may be some doubt, those straps and components not considered to be primary straps and components shall be removed from the harness prior to performance testing. If the harness meets the performance requirements of Appendix A when tested in this condition, then the straps and components removed prior to testing can be considered to be secondary straps and components.

SECONDARY STRAPS AND COMPONENTS – Straps or components that take the minority or no load in the event of a fall, and which may be intended mainly for locating purposes.

NOTE – See the NOTE to the definition of primary straps and components.

STATUTORY AUTHORITY – A body administering Ordinances, Acts of Parliament, Regulations or Rules under such Acts.

TILT THE WEARER FORWARD – Ensuring the angle of the coronal plane of the body above the waist of a lifejacket wearer is greater than 0° with respect to the vertical plane.

PART 2 SELECTION OF BUOYANCY AIDS

201 TYPES OF BUOYANCY AIDS

Buoyancy aids range from lifejackets, of the type carried by commercial vessels, to float-off buoyancy aids designed to assist flotation.

201.1 Lifejackets

201.1.1

Lifejackets in this Standard are open-waters lifejackets complying with the requirements of section 401.

201.1.2

Open-waters lifejackets are designed to assist in turning the wearer to a safe floating position.

201.1.3

Some lifejackets may be designed to conserve body heat when the wearer is immersed.

201.2 Personal flotation devices

201.2.1

In-shore waters personal flotation devices in this Standard shall comply with the requirements of section 402.

201.2.2

Personal flotation devices as described above will improve a wearer's chances of survival, but do not guarantee a wearer's safety and ultimate rescue.

201.3 Buoyancy vests

201.3.1

Specifications for buoyancy vests are set out in section 403.

201.3.2

Buoyancy vests are intended to assist in supporting the wearer in water. They are less bulky than a lifejacket and personal flotation device, with less buoyancy, and allow more freedom of movement for aquatic sports. They are not designed to turn the wearer to a safe floating position.

201.3.3

Some buoyancy vests may be designed to conserve body heat when the wearer is immersed.

201.4 Buoyancy-aid wet suits

201.4.1

The requirements for buoyancy-aid wet suits are set out in section 404.

201.4.2

Buoyancy-aid wet suits are designed to conserve body heat when the wearer is immersed in water and help to avoid hypothermia.

201.4.3

They are not designed to turn the wearer to a safe floating position but allow more freedom of movement for aquatic sports.

C201.4.3 CAUTION – *These suits may cause some instability of support (because a proportion of the buoyancy is positioned in the legs) which could cause concern to the inexperienced wearer.*

201.5 Buoyancy garments

201.5.1

The requirements for buoyancy garments are set out in section 405.

201.5.2

Buoyancy aids in this category are designed to be worn on the person. They provide the same buoyancy as a buoyancy vest, but may not meet the requirements for lifejackets, personal flotation devices or buoyancy vests. They may be designed to gain greater wearer acceptance.

201.6 Specialist personal flotation device

201.6.1

The requirements for specialist personal flotation device are set out in section 406.

201.6.2

Specialist personal flotation devices in this category are designed to be worn on the person but may not meet the requirements for lifejackets, personal flotation devices or buoyancy vests. They may be designed to gain greater wearer acceptance being more comfortable, and allowing greater freedom of movement, while meeting additional safety requirements in relation to the severe conditions experienced in specific aquatic pursuits.

201.7 Rescue buoys

201.7.1

Specifications for rescue buoys are set out in section 501.

201.7.2

These aids are designed to be thrown or otherwise delivered to a person in the water to assist rescue. They may be fitted with a light, smoke marker or elevated flag for position marking.

201.6.3

When thrown from a boat or the shore, they should be attached to a lifeline. The rescuer can then pull a person to safety.

201.8 Float-off buoyancy aids

201.8.1

Specifications for float-off buoyancy aids are set out in section 601.

201.8.2

Float-off buoyancy aids are designed to be carried loose in boats. In the event of a boat sinking, they will rise to the surface and can be used to assist flotation. Items such as buoyancy cushions are included in this classification.

202 SELECTION OF BUOYANCY AIDS

202.1 General

202.1.1

In the selection of a buoyancy aid, consideration must be given to the requirements or recommendations of the Statutory Authority or the Controlling Body, or both.

202.1.2

As a general rule, buoyancy aids should always be worn on board by the occupants of a boat. Buoyancy vests and buoyancy garments should be worn while there is any risk of accidental immersion in water. Rescue buoys and float-off buoyancy aids should be located near the water, for example riverbanks or surf beaches, or carried on boats for additional assistance to swimmers and rescuers.

202.2 Factors in selection

202.2.1

The factors to be considered in the selection of a buoyancy aid include the following:

- (a) The requirements or recommendations of the Statutory Authority;
- (b) The requirements or recommendations of the Controlling Body;
- (c) The conditions of the water where the buoyancy aid may be used, for example – rivers, in-shore waters or open-waters;
- (d) Water temperature;
- (e) Size of the wearer;
- (f) The purpose for which the buoyancy aid will be used; for example, fishing, sailing, jet or power-boat racing.

C202.2.1 CAUTION – A lifejacket or personal flotation device should fit the wearer correctly in order for it to achieve the best possible performance.

202.2.2

The buoyancy aid affording the maximum flotation should be selected, consistent with the proposed use.

202.2.3

It should be noted that the swimming ability of the wearer is not included in these factors.

202.3 Effectiveness of buoyancy aids

202.3.1

The design, manufacture and testing of buoyancy aids provides for a compromise of the best performance possible within the limitations of body sizes, body mass ranges and the restrictions of usage, stowage and storage in small boats.

202.3.2

The effectiveness of buoyancy aids is considerably reduced in rough water, breaking seas and surf. The selection of an aid for use primarily in these conditions, and in cases where speedy rescue is

unlikely, should tend toward the aid designed with maximum buoyancy, such as Type 401 open-waters lifejacket. Such a choice, however, must be made having regard to the physical activity requirement of the wearer, the length of time the aid is worn, and the stowage available in the boat.

202.3.3

Ease of donning and comfort of the wearer are achieved by reducing the bulk and consequently, within acceptable limits, the performance of a lifejacket, personal flotation device and buoyancy vest. These criteria are incorporated in the design of each of these aids to afford the wearer the best possible personal flotation, with minimum physical restraint, for extended periods in the general conditions which may be expected in pleasure vessels.

202.3.4

The use of a buoyancy aid does not guarantee the safety and ultimate rescue of a wearer, but the use of a properly selected buoyancy aid will greatly enhance the chance of survival should an emergency occur.

202.4 Lifejackets and personal flotation devices

Although lifejackets and personal flotation devices may restrict movement, they should be worn at all times.

202.5 Buoyancy vests

Controlling Bodies having jurisdiction may require that buoyancy vests be worn at certain times.

202.6 Buoyancy garments

These may be presented in a variety of designs and colours and may range from garments for specific activities to aids for emergency use.

202.7 Buoyancy-aid wet suits

These suits will be useful in a situation where an aquatic sport such as yachting and board sailing involves constant wetting, and where protection from hypothermia is required.

202.8 Rescue buoys

Where practicable, rescue buoys should be fitted with a lifeline which floats. The rescue buoy will assist in flotation until rescue is effected by pulling on the lifeline.

202.9 Float-off buoyancy aids

Loose buoyancy devices should be carried in all boats. Such aids provide additional flotation for survivors in the event of the boat sinking.

202.10 Aids to rescue

Any buoyancy aid may be provided with facilities to assist rescue. These may include whistle, light, retroreflective tape, dye marker, smoke flare and beckets. The latter are not fitted to lift the wearer from the water, but to assist in rescue.

202.11 Instruction in the use of buoyancy aids

202.11.1

All persons should be instructed in the use of buoyancy aids. The instruction should include donning, correct fastening, performance limitations and "in-water" use of the aids. Persons who have been instructed in the use of buoyancy aids will have less difficulty in the event of an emergency.

202.11.2

Children using buoyancy aids in the water should be under competent supervision at all times.

PART 3 GENERAL REQUIREMENTS FOR BUOYANCY AIDS

301 SCOPE AND APPLICATION

301.1 Scope

This Part sets out the general requirements of all buoyancy aids described in Part 4 of this Standard.

301.2 Application

Buoyancy aids of the type defined in section 102 shall comply with the requirements of this Part of this Standard, in addition to the requirements of the relevant section for the particular aid.

302 GENERAL DESIGN

302.1 Ease of donning and removal

302.1.1

A buoyancy aid intended to be worn on the body shall be designed so that it can be donned and removed quickly and correctly with a minimum of instruction.

302.1.2

The opening through which the wearer's head is passed, in buoyancy aids intended to be donned in this manner, shall be such that the buoyancy aid can be fitted over a head of at least 610 mm circumference without undue force or discomfort to the wearer.

NOTE – The provision of means of adjustment to the head opening may be necessary if compliance with the requirements of 401.6 is to be met.

302.2 Security of fit

A buoyancy aid intended to be worn on the body shall be constructed to fit the wearer securely. This may be achieved by the provision of adjustments. When fitted tightly it shall be incapable of displacement about the wearer in any way which may impair the performance of the aid.

The addition of a crotch-strap will reduce the risk of the device riding up when the wearer is immersed in water.

302.3 Comfort

A buoyancy aid intended to be worn on the body shall be designed to afford reasonable comfort and allow freedom of movement to the wearer, both in and out of the water. Fittings shall cause no discomfort.

302.4 Freedom from defects

A buoyancy aid shall be free from defects liable to impair its serviceability or injure the wearer.

302.5 Buoyancy

When determined in accordance with Appendix B, the buoyancy of a buoyancy aid shall be not less than the value stated in the relevant Standard.

302.6 Non-metallic

No metallic part or parts shall deflect a magnetic compass by more than 1° when tested in accordance with Appendix L.

303 SOURCE OF BUOYANCY

303.1 General

The buoyancy of a buoyancy aid shall be derived essentially from the incorporation of buoyant material specified in 303.2 or from inflatable chambers specified in 305.3.

303.2 Closed-cell plastics

303.2.1

Closed-cell plastics material shall have at least 90 % of its cells non-communicating. The cell structure shall be substantially uniform and the material shall be resistant to the action of salt water, petroleum products and sunlight.

303.2.2

The volume of individual pieces of closed-cell plastics material incorporated in pockets in an outer covering (see 304.1) shall be not less than 80 cm³, except in float-off buoyancy aids.

304 PROTECTION OF SOURCE OF BUOYANCY

304.1 Closed-cell plastics

Closed-cell plastics shall be protected by one of the following:

- (a) Secure incorporation in pockets formed in an outer covering (see section 305) in such a manner that the volume of entrapped air or water in individual pockets is minimal;
- (b) The application of a coating complying with the requirements of 305.2;
- (c) If neither (a) nor (b) applies, closed-cell plastics shall comply with the requirements of 305.2.1.

305 OUTER COVERING MATERIALS

305.1 General

Clauses 305.1.1 to 305.2.1 do not apply to inflatable buoyancy aides.

305.1.1

Unsupported plastics film or sheeting shall not be used as an outer covering material.

305.1.2

Outer covering material for buoyancy aids shall comply with the following requirements:

- (a) Tearing test. Uncoated or plastics-coated textiles shall have a tear resistance of not less than 33 N in any direction when tested in accordance with AS 2001.2.10.
- (b) Coating adhesion. When determined in accordance with BS EN ISO 2411, the force required to strip any coating from the base fabric shall be not less than 6.9 N/cm.
- (c) Resistance to flex cracking. When coated material (for open-waters lifejackets, in-shore personal flotation devices, buoyancy vests, buoyancy garments and specialist personal flotation device) is tested in accordance with Method B of ISO 7854, the coating shall withstand without cracking 200 000 flexing cycles. For coated material for rescue buoys and float-off buoyancy aids, tested in accordance with Method B of ISO 7854, the coated material shall withstand without cracking 100 000 flexing cycles.

- (d) Knitted textiles which are not coated. Knitted textiles which are not coated or bonded to other materials shall have a mean bursting force of not less than 400 N when tested in accordance with Appendix P.
- (e) Neoprene. Neoprene or similar wet suit type materials shall have a knitted textile bonded to the outer side of the neoprene. When tested in accordance with Appendix P the neoprene textile composite shall have a mean bursting force of not less than 400 N on either surface.

305.2 Coating for closed-cell plastics

Where closed-cell plastics are protected by the application of a coating, the coating shall be fully cured flexible compound and shall comply with table 300.1.

**Table 300.1 – Test requirements for protective skin coatings
and uncoated expanded plastics buoyant material**

Property	Minimum requirement	Method of test
Tensile strength	16 N/cm width	Method 320A of BS 2782
Elongation at break	170 %	Method 320A of BS 2782
Tear strength	5.3 N	Refer to BS 3424:Part 5
Adhesion of expanded plastics base	3.5 N/cm width	BS 3424 except that a rate of jaw separation of 5 cm/min shall be used
*Abrasion resistance	Not less than abrasion resistance of materials meeting requirements of 305.1	Using 100 rubs of crockmeter with 240 grade carborundum paper or similar objective test
* This is for uncoated closed-cell plastics only. The other tests apply to protective skin coatings only.		

305.2.1 Closed-cell plastics without covering or coating

The skin of closed-cell plastics not complying with 304.1 (a) or (b) shall meet the abrasion requirements of table 300.1 and the bulk material shall have an average tear resistance for five specimens of not less than 49 N determined according to ASTM D 3574-03, Test F.

305.3 Inflatable chambers**305.3.1 Requirements for materials**

The material used as the wall or walls of the inflatable chamber or chambers of the buoyancy aid shall comply with the following:

- (a) Basic requirements. The material shall consist of suitable 'proofed' or coated woven synthetic fabric. The air-holding or gas-holding layer shall not be on the outside and the base textile material shall be a brightly-coloured high tenacity synthetic fibre;
- (b) General requirements for coated fabrics:
- (i) Coating adhesion. The adhesion between coating and fabric, when determined in accordance with BS EN ISO 2411, shall be not less than 54 N/50 mm width at a rate of separation not exceeding 5 mm in 5 min

- (ii) Tearing strength. The tearing strength of the coated fabric when determined in accordance with Method 7A of BS 3424 (BS 3424 Part 5 is partially replaced by BS EN ISO 4674.1), shall be not less than 45 N in the warp and 33 N in the weft direction
 - (iii) Air porosity. The resistance of the coated fabric to air penetration shall be such that when the fabric is tested in accordance with Appendix D, there shall be no bubbles at a pressure of 27.5 ± 1.0 kPa
 - (iv) When coated material is tested in accordance with Method B of ISO 7854, the coating shall withstand without cracking 200 000 flexing cycles. For coated material for rescue buoys and float-off buoyancy aids, tested in accordance with Method B of ISO 7854, the coated material shall withstand without cracking 100 000 flexing cycles;
- (c) Resistance to flex cracking. When coated material (for open-waters lifejackets, in-shore personal flotation devices, buoyancy vests, buoyancy garments and specialist personal flotation device) is tested in accordance with Method B of ISO 7854, the coating shall withstand without cracking 200 000 flexing cycles. For coated material for rescue buoys and float-off buoyancy aids, tested in accordance with Method B of ISO 7854, the coated material shall withstand without cracking 100 000 flexing cycles;
- (d) Additional requirements for rubber-coated fabrics:
- (i) Vulcanization. When the rubber-coated fabric is tested in accordance with Appendix E, it shall be shown to have been satisfactorily heat cured
 - (ii) Resistance to copper. The proofing shall contain not less than 1 % by mass of copper-inhibiting antioxidant based on the mass of the rubber;
- (e) Additional requirements for PVC-coated fabrics:
- (i) Loss of mass on heat-ageing. When the PVC-coated fabric is tested in accordance with BS 3424.12, the loss of mass shall not exceed 1.5 %
 - (ii) Degree of fusion. When the PVC-coated fabric is tested in accordance with Method 25A of BS 3424.22, there shall be no cracking or disintegration of the coating.

305.3.2 Requirements of fabrication

The fabrication of the chamber or chambers shall be in accordance with the following requirements:

- (a) Burst strength. The strength of the material and the quality of the fabrication of the chamber or chambers shall be such as will enable them to withstand without failure inflation to a minimum pressure of 20 kPa;
- (b) Non-welded seams. All non-welded seams shall be covered by seam tape on the inside of the flotation chamber. Seam tapes shall be applied with an equal width of tape on either side of the seam which it covers. Where tapes have to be joined, the ends shall be overlapped not less than 20 mm and rounded off. All seams and areas in the vicinity of stuck patches and fabric fittings shall be dusted liberally with french chalk.

305.3.3 Resistance to puncturing

The resistance of the inflatable chamber or chambers to puncturing shall be such that, when the inflated buoyancy aid is tested in accordance with Appendix C, either there is no puncturing or a force greater than 30 N is required to puncture the chamber or chambers.

306 WEBBING, TAPES AND CORDS

306.1

All webbing, tapes or cords which form part of the buoyancy aid shall have a breaking strength of not less than 1300 N. If intended to bear directly on the body of the wearer, they shall be not less than 25 mm wide when wet and shall be designed to resist roping and rolling when in use.

306.2

Tapes shall be shrink-resistant to the extent that after they have been immersed in cold water for a minimum of 2 h and then allowed to dry, any shrinkage in the longitudinal direction does not exceed 1.0 %.

306.3

Webbing tapes and cords shall be securely fastened to – or incorporated in – the buoyancy aid.

307 SEWING

307.1 Thread

Threads for sewing of components shall have similar properties to the materials being sewn and shall have a minimum breaking strength of 30 N. If pure natural fibre thread is used, it shall be treated to resist rotting and shall not be used to sew load-bearing components.

NOTE – Natural fibre may be used as a component of a sewing thread.

307.2 Stitching

307.2.1

All stitching shall be in lockstitch conforming to Stitch Type 301 of BS 3870, as illustrated in Appendix F, or a suitable locking type stitch, appropriate to the material being sewn.

307.2.2

The needles used shall be as fine as is consistent with the thread. The stitching shall be uniform without twists or puckers. The ends of each row of stitching and any breaks shall be made secure and neatly trimmed. Where breakage has occurred stitching shall be restarted not less than 25 mm back from the break and oversewn.

307.3 Strength of finished seams

The strength of the finished seams shall be such that the seams will remain intact when the buoyancy aid is tested for strength of the fastening device or devices in accordance with Appendix G.

308 FASTENINGS AND FITTINGS

308.1

All fastenings and fittings shall be free from burrs and sharp edges and shall be suitable for their intended use. Press-studs shall not be used as the primary fastener of a buoyancy aid about the body of a wearer. Slide fasteners shall be of strength, durability and quality appropriate to their function.

NOTE – AS 2332 covers all types of slide fasteners.

308.2

All “D” rings shall be welded at the join.

308.3 Strength of fastening device or devices

When tested in accordance with Appendix G, a buoyancy aid that has been assembled and fastened in accordance with the manufacturer's instructions shall withstand without damage and without slippage of adjustment of fastening devices, a pull of not less than 890 N. This test does not apply to crotch straps as required for child small and child extra small PFDs personal flotation devices. The test for compliance would be how the PFD performed in the in-water performance tests.

309 INFLATABLE CHAMBERS**309.1 Means of inflation****309.1.1**

The buoyancy chamber or chambers shall be provided with means for mechanical inflation and, in addition, shall be capable of being inflated orally. The provision for mechanical inflation may be either manually operated or fully automatic.

309.1.2

Oral inflation shall be allowed provided that the buoyancy aid has another source of buoyancy to the standard required by that class of buoyancy aid.

309.2 Manually-operated inflation mechanisms

Where the mechanical means for inflation is of the manually-operated type, the inflation mechanisms shall comply with the following requirements:

- (a) Ease of operation. The triggering device of the mechanism shall be so designed that it will be effectively operated by an applied force of 65 ± 7 N;
- (b) Rate of inflation. The buoyancy aid shall be fully inflated within 5 s of the application of the force prescribed in (a) above.

309.3 Fully automatic inflation mechanism**309.3.1**

Where the mechanism means for inflation is of the fully automatic type, the mechanism shall be such as will enable the buoyancy aid to comply with the following requirements:

- (a) Rate of inflation. The buoyancy aid shall be fully inflated within 5 s of submersion in water.
- (b) Inadvertent operation. When the buoyancy aid is tested in accordance with Appendix H, the inflation device shall not operate.

309.3.2

All mechanically inflatable buoyancy aids shall include a visible means to indicate that the mechanism which operates the mechanical inflation has been operated.

309.4 Oral inflation device

The provision for oral inflation shall comply with the following requirements:

- (a) Mouthpiece. The mouthpiece shall have a smooth finish free from burrs, sharp edges and be non-corrosive. It shall be located so as to be accessible to the mouth when the aid is worn;

- (b) Ease of operation. The non-return valve shall be so designed that it will not open when an air pressure of less than 0.5 kPa is applied at the mouthpiece, but will be opened at least partially, by an applied air pressure of 2.5 kPa;
- (c) Rate of inflation. The rate of air flow into the chambers resulting from an air pressure of 6.9 ± 0.4 kPa applied to the mouthpiece shall not be less than 85 L/min when tested in accordance with Appendix I.

309.5 Strength of attachment of inflating mechanism

The strength of attachment of the inflating mechanism, where this is located on the outside of the buoyancy chamber, or chambers, shall be such that when a minimum steady force of 445 N is applied to the mechanism in accordance with Appendix J, with the buoyancy aid inflated and mounted on a dummy, the buoyancy chamber or chambers will not deflate.

309.6 Pressure-relief valve

Mechanically inflatable chambers may be fitted with a pressure-relief valve designed to operate at a pressure not greater than 15 kPa.

309.7 Gas cylinders

Gas cylinders shall comply with the following requirements:

- (a) Type. The gas cylinder may be of either the expendable or the rechargeable type and shall be charged with CO₂ and comply with requirements (b) to (h) below;
- (b) Construction. The gas cylinder shall be made of suitable material and shall be of seamless construction. It shall be designed to withstand without failure an internal pressure of not less than 54 MPa.

NOTE – Rechargeable cylinders should be subject to an internal hydrostatic test pressure of 29.5 ± 0.5 MPa. If the permanent strain at any section of the barrel diameter exceeds 25 μ m, the cylinder should be destroyed. This test should be conducted at 10 years and each 12 months thereafter. Rechargeable cylinders should be discarded after 14 years;

- (c) Testing. One cylinder in 500 shall be tested in the following manner and shall be destroyed after testing:
 - (i) Shock test. When the correctly-charged cylinder is dropped from a height of not less than 6 m on to a concrete surface, no leak shall result
 - (ii) Material proving test. All test cylinders passing the shock test described in (i) above, shall be submitted to an internal application of pressure (excluding the sealing disk) and be capable of withstanding an internal pressure of 54 MPa without bursting. If the cylinder fails, all cylinders from the particular production batch shall be deemed not to comply with this Standard;
- (d) Filling ratio. In no circumstances shall any cylinder contain gas in excess of 68 % by mass of the total water capacity of the cylinder. The weighing tolerance of the contents shall be ± 1 g (for example, a cylinder designed to contain 29 g of CO₂ shall be charged to 29 ± 1 g);
- (e) Leakage. Where cylinders are not certified by the manufacturer by use of a recognized test method in regard to leakage, the contents of the cylinder shall be determined by weighing at the beginning and the end of a 21-day storage period. If by such weighing, or any other means of equivalent accuracy, a loss of mass is shown greater than 0.1 g, the cylinder shall be deemed not to comply with this Standard. For a rechargeable cylinder, such a mass loss shall not preclude its continued use after it has been refilled and has satisfactorily passed this test;

- (f) Safe life. Both rechargeable and expendable types of gas cylinder shall have a safe life of not less than 10 years from date of manufacture, subject to implementation by the user of the instructions for care of the cylinders issued with the buoyancy aid;
- (g) Tare mass and total mass:
 - (i) Tare mass. For the purpose of marking (see (h) below)
 - (A) The tare mass of expendable cylinders shall include the mass of the cylinder and any components fitted permanently thereto
 - (B) The tare mass of rechargeable cylinders shall be the mass of the cylinder complete with the gas-retaining enclosure only
 - (ii) Total mass. For the purpose of marking (see (h) below), the total mass shall be the tare mass plus the minimum mass of the charge contained;
- (h) Marking. Each cylinder, or a component permanently fitted thereto, shall be legibly and indelibly marked with the following:
 - (i) Tare mass to the nearest 0.1 g
 - (ii) Minimum mass of charge or minimum total mass to the nearest 0.1 g
 - (iii) For rechargeable cylinders, the month and year of manufacture and the month and year of the last hydrostatic test.

310 RESISTANCE TO CORROSION

When tested in accordance with ISO 9227 for a period of 96 h metal components shall not be significantly affected by corrosion. This shall be tested by a functional test following the corrosion test.

311 RESISTANCE TO CRUSHING

The buoyancy aid shall have a resistance to crushing such that its buoyancy, when determined in accordance with Appendix B but omitting the 24 h immersion, will be not less than the minimum prescribed in the relevant Part of this Standard after the aid has been subjected for at least 5 min to a force of 730 ± 30 N distributed uniformly over its area when normally folded. The buoyancy shall be determined within 2 min after removal of the force.

312 RESISTANCE TO HEAT

The ability of the buoyancy aid to withstand prolonged exposure to heat shall be such that, after it has been subjected to a temperature of 60 ± 2 °C for $168 -0+5$ h, it will show no signs of damage, and when the aid is tested in accordance with Appendix B, its buoyancy will be not less than the minimum prescribed in the relevant Part of this Standard.

313 RESISTANCE TO PETROLEUM PRODUCTS

The buoyancy aid and its components which are exposed to immersion in kerosene shall have resistance to the action of petroleum products and meet the buoyancy requirements of the relevant Part of this Standard, and be in accordance with Appendix K.

314 COMPLIANCE

At least one buoyancy aid from each production batch shall be tested for buoyancy as specified in Appendix B and shall be checked for general compliance with this Standard. For batch purposes a batch consists of that number of the same type and size of buoyancy aid manufactured within a period of six months with a maximum batch quantity of 500. The results shall be recorded.

315 INFORMATION TO BE SUPPLIED BY THE MANUFACTURER

In addition to the information marked on the buoyancy aid, the information as set out in Appendix Q shall be supplied with each buoyancy aid. The wording may alter from that used in Appendix Q provided that all the information is included.

316 MARKING

Each buoyancy aid shall be legibly and indelibly marked in a contrasting colour with the following information:

- (a) The manufacturer's name, trade name or trademark;
- (b) The manufacturing batch identification and the year of manufacture.

NOTE – The manufacturing batch identification should be such as to enable the manufacturer to identify each batch of garments manufactured during the calendar year;

- (c) The information specified in the relevant Part of this Standard for each type of buoyancy aid.

NOTE – THE NEW ZEALAND PRODUCT CERTIFICATION MARK SCHEME

As this Standard covers product safety, manufacturers are advised to apply for a licence to use the New Zealand Product Certification Mark. For further details contact Bureau Veritas New Zealand.

317 CROTCH STRAPS

317.1

It is recommended that manufacturers supply attachment points for universal type crotch straps to be fitted at, or after the time of purchase on the following buoyancy aids designed to be worn on the body:

- (a) The supply and fitting of crotch -straps is mandatory for all Type 401 and 402 child small (12 – 25 kg) and extra-small (10 – 15 kg) buoyancy aids;
- (b) Crotch straps are recommended for all Type 401 and 402 buoyancy aids, and should be able to be retro-fitted.

Crotch straps are also recommended for Type 406 buoyancy aids, where they are able to be fitted without compromising the effectiveness of the buoyancy aids' performance (e.g. where a spray skirt is fitted in, it may be impractical to use a crotch strap).

PART 4 SPECIFIC REQUIREMENTS FOR BUOYANCY AIDS

401 OPEN-WATERS LIFEJACKETS

401.1 Scope

This section sets out the requirements for lifejackets anticipated for use in boats in open-waters where early rescue may not always be expected.

401.2 Application

Open-waters lifejackets shall comply with the requirements of Part 3 of this Standard in addition to this section.

401.3 Classification

Open-waters lifejackets shall be classified in terms of the minimum buoyancy deemed to be adequate for intended wearers as specified in 401.4.

Body mass	Wearer
40 kg and over	Adult
22 kg to 40 kg	Child – Medium
12 kg to 25 kg	Child – Small
10 kg to 15 kg	Child – Extra Small

401.4 Minimum buoyancy

When determined in the manner described in Appendix B, the buoyancy of the open-waters lifejacket shall be not less than the following:

Body mass	Minimum buoyancy – inherent	Minimum buoyancy – inflatable
40 kg and over	100 N + 10 %*	150 N
22 kg to 40 kg	75 N + 10 %*	90 N
12 kg to 25 kg	60 N + 10 %*	60 N
10 kg to 15 kg	60 N + 10 %*	60 N

*As a quality assurance buffer to compensate for variance in buoyancy material batch consistency.

401.5 In-water performance

401.5.1 General

The performance of the open-waters lifejacket is tested by applying the test requirements described in Appendix L.

401.5.2 Requirements

The open-waters lifejacket when tested in accordance with Appendix L shall:

- (a) Be able to be donned within 30 s and be easily removable;
- (b) Have all belts and fastenings able to be closed and adjusted to a snug fit;
- (c) Not become grossly displaced on the wearer;
- (d) Not seriously restrict the wearer's ability to swim.

401.5.3 Righting requirements

The open-waters lifejacket when tested in accordance with Appendix L shall:

- (a) Not tilt the wearer forward;
- (b) Turn or roll the wearer so that the wearer's mouth is brought clear of the water within 5 s and stabilize the wearer in a backwards inclined position. While in this position the buoyancy aid shall:
 - (i) Not "ride-up" to such a degree as to cause excessive discomfort to the wearer, or impede respiration
 - (ii) Have no tendency to "ride-up" to such a degree that the potential exists for it to continue over the wearer's head
 - (iii) Hold the nose and mouth of the wearer well clear of the water. (See NOTE to 401.5.5.)

401.5.4

The open-waters lifejacket shall be capable of being worn inside-out or clearly capable of being worn in only one way and, as far as possible, cannot be donned incorrectly.

401.5.5

After the tests as specified in Appendix L have been completed the test lifejacket shall be considered satisfactory when the average of all its righting times (for all subjects) shall not exceed 5 s.

NOTE – The test for righting motion of the lifejacket is to determine whether the average wearer can be turned to a safe floating position. It is a comparative test only and a lifejacket which passes this test may not necessarily turn all wearers to a safe floating position in all conditions of use.

401.6 General design

401.6.1 Collar

The open-waters lifejacket shall be provided with a collar or other suitable means for supporting the head of a floating wearer. With the lifejacket secured in accordance with the manufacturer's instructions, the portion of the lifejacket behind the neck shall not rise above the wearer's head when entering the water.

401.6.2 Whistle

The open-waters lifejacket shall be provided with a non-metallic whistle.

401.6.3 Ability to withstand impact

The open-waters lifejacket shall be strong enough to withstand without damage the impact of a wearer falling or jumping into the water from a height of 3 ± 0.3 m. In addition, on impact the lifejacket shall not be dislodged or damaged.

401.7 Source of buoyancy

The buoyancy of an open-waters lifejacket shall be derived essentially from materials specified for the source of buoyancy in Part 3 of this Standard.

NOTE – It is permissible for the collar to have a different source of buoyancy from that used in the body of the jacket.

401.8 Fittings

Fittings such as trapeze or parachute harnesses, lifeline attachments or windsurfing harnesses may be incorporated into the open-waters lifejacket. They shall be designed so that no thrust or stress is placed on the lifejacket, but is transmitted direct from the wearer to the fitting. The strength of fittings

such as trapeze or parachute harnesses, or lifeline attachments shall be sufficient to sustain a load of 3 ± 0.15 kN.

401.9 Visibility at night

401.9.1

The open-waters lifejacket shall include retroreflective tape. Where retroreflective tape is used it shall be attached at two places on the lifejacket as high on the jacket as is practical to enable it to be seen when the wearer is in a backward floating position. The tapes shall be in such positions that they are not obstructed by the wearer. The size of each piece shall be greater than or equal to 1875 mm^2 .

401.9.2

The reflectrofective tape shall comply with either:

- (a) The International Maritime Organization Resolution A.658(16) dated 20 November 1989, Annex, Type I and Type II Classification; or
- (b) The requirements, specified in AS 2259.

401.10 Colour

401.10.1 *Open-waters lifejacket colour*

The colour of the open-waters lifejacket when immersed in water shall approximate one of the following colours from BS 381C. Where this is an inflatable lifejacket the colour relates to the bladder material only.

No. 309	Canary yellow
No. 363	Bold yellow
No. 355	Lemon
No. 356	Golden yellow
No. 592	International orange
No. 593	Rail red
No. 537	Signal red
No. 564	Bold red

Compliance with the above requirement shall be assessed by a panel of two members. If the panel is not unanimous that the material under test conforms, then the colour of the lifejacket when immersed in water shall have chromaticity co-ordinates within the area defined by the four points in table 400.1 for one of the colours specified. The luminance factor shall be as shown in table 400.1.

401.10.2 *Colour fastness*

The colour fastness of the open-waters lifejacket to the action of light and of seawater shall be as follows:

Light – When the ratings are determined in accordance with AS 2001.4.21, the value obtained shall be not less than 4 on the Blue Wool Standard.

Seawater – When the ratings are determined in accordance with AS 2001.4.14, the value obtained for the colour change shall be not less than 4 on the Grey Scale.

Table 400.1 – Limits of buoyancy-aid colours in terms of the CIE 39.2 Colorimetric Systems and measured with standard illuminant D₆₅ at 45/0 geometry

Colour	Chromaticity co-ordinates of the corners of the colour spaces					Minimum luminance factor
Yellow	X	0.531	0.477	0.427	0.465	0.45
	Y	0.468	0.433	0.483	0.534	
Red – orange	X	0.690	0.595	0.516	0.584	0.14
	Y	0.310	0.315	0.394	0.416	

401.11 Strength of neck opening and fastening device or devices

401.11.1

When tested in accordance with Appendix G, the open-waters lifejacket, after it has been assembled and fastened in accordance with the manufacturer's instructions, shall withstand, without damage and without slippage of adjustment of fastening devices, a pull of 1300 ±20 N applied in turn across the fastened jacket and to that part of the jacket intended to support the head. A lifting strop on the collar shall be provided.

401.11.2

The lifting strop shall be tested in accordance with Appendix G, except where the terms 'fastening device, fastenings or adjustments' occur in the Appendix the term 'lifting strop' shall be inferred.

401.11.3

The lifting strop shall withstand a pull of 1300 ±20 N for 5 min ±30 s without breaking. Tearing that occurs during the test shall not be deemed as a failure, provided that the load is still sustained.

401.12 Marking

401.12.1 General requirements

In addition to the requirements of section 316, the inherent buoyancy 401/Open-waters lifejacket shall be legibly and indelibly marked in a contrasting colour, with the following:

- (a) The words "401/OPEN-WATERS LIFEJACKET" conspicuously placed, in block letters not less than 6 mm high and beneath that, clearly visible the words – "When worn correctly, this buoyancy aid is intended to hold an unconscious wearer's head above water in most conditions", and:
 - (i) Open-waters lifejackets adult and child medium:
 - (1) "When worn, this open-waters lifejacket will improve a wearer's chances of survival, but its use does not guarantee your safety and ultimate rescue of the wearer, but will afford support in the water for an extended period
 - (2) The effectiveness of your open-waters lifejacket is greatly increased if a crotch strap is fitted to prevent it from riding up over your head"

(ii) PFD Child extra small and small:

- (1) "When worn, this open-waters lifejacket will improve a wearer's chances of survival, but its use does not guarantee your safety and ultimate rescue of the wearer, but will afford support in the water for an extended period
- (2) The crotch strap must always be securely fastened";

- (b) Intended body mass range and chest size;
- (c) Minimum buoyancy;
- (d) Method of donning, securing and adjusting;
- (e) Clear identification of the front and back where any possibility of confusion may exist;
- (f) A warning as follows: "The effectiveness of a buoyancy aid is considerably reduced in rough water, breaking seas and surf";
- (g) Number of this Standard and year – e.g. NZS 5823:2005.

401.12.2 Special requirements for children's lifejackets

In addition to the marking specified in (a) to (g) of 401.12.1 and the requirements of section 315, children's open-waters lifejackets shall be legibly and indelibly marked with the following:

- (a) The words "OPEN-WATERS LIFEJACKET, CHILD – MEDIUM, SMALL or EXTRA-SMALL" as appropriate, conspicuously placed, in block letters not less than 6 mm high;
- (b) The words "CAUTION: The child wearing this open-waters lifejacket should be under constant supervision". The text shall be conspicuously placed and the word "CAUTION" shall be in block letters of a height not less than 6 mm.

401.12.3 Marking for open-waters lifejackets using inflatable chambers as a means of buoyancy

These personal flotation devices shall be marked as follows where applicable:

- (a) Simple instructions for use (e.g. "Pull red knob to inflate");
- (b) Where inflated by compressed gas, an instruction to check that the cylinder is fully charged; the weight of the correct charge for rechargeable cylinders or the minimum total weight for full expendable cylinders;
- (c) In the case of partially inherently buoyant personal flotation devices, a statement of the amount of uninflated buoyancy;
- (d) Inflatable and partially inherently buoyant personal flotation devices shall carry a warning to the effect that "This personal flotation device is effective only when fully inflated";
- (e) For personal flotation devices inflatable by compressed gas a warning in the following terms, "Do not operate gas inflation if already inflated".

402 IN-SHORE WATERS PERSONAL FLOTATION DEVICES**402.1 Scope**

This section sets out the requirements for personal flotation devices anticipated for use on in-shore waters where early rescue may be expected.

402.2 Application

Personal flotation devices shall comply with the requirements of Part 3 of this Standard in addition to this section.

402.3 Classification

In-shore waters personal flotation devices shall be classified in terms of the minimum buoyancy deemed to be adequate for intended wearers, within the ranges of body mass as follows:

Body mass	Wearer
40 kg and over	Adult
22 kg to 40 kg	Child – Medium
12 kg to 25 kg	Child – Small
10 kg to 15 kg	Child – Extra Small

NOTE – THIS STANDARD DOES NOT INCLUDE PERSONAL FLOTATION DEVICES FOR BODY MASS UNDER 10 kg (1 YEAR). This is because of design difficulties caused by the shape and size of the body and problems with testing such a jacket.

402.4 Minimum buoyancy

When determined in the manner described in Appendix B, the buoyancy of the personal flotation device shall be not less than the following:

Body mass	Minimum buoyancy – inherent	Minimum buoyancy – inflatable
40 kg and over	71 N + 10 %*	100 N
22 kg to 40 kg	49 N + 10 %*	60 N
12 kg to 25 kg	40 N + 10 %*	40 N
10 kg to 15 kg	35 N + 10 %*	40 N

*As a quality assurance buffer to compensate for variance in buoyancy material batch consistency.

402.5 In-water performance**402.5.1 General**

In-water performance shall be as specified in 401.5.1 and 401.5.2.

402.5.2 Distribution of buoyant material

The distribution of buoyant material shall be such that the personal flotation device will safely support the wearer. Any tendency for the wearer to be tilted forward from the vertical in the water shall be considered to be unsafe. (Refer to Appendix L 3.1.2 (d) for test).

402.5.3 Children's personal flotation devices**402.5.3.1**

Due to the difficulties inherent with personal flotation device testing using child subjects, it is recognized that the tests specified in Appendix L may not be totally practicable, and the judgment of the technician will play a greater role.

402.5.3.2

The final ruling must be based on as many “usable” test results as possible, and where necessary, the subjective analysis of the technician, who must at all times be guided by the scope of the Standard.

402.6 General design**402.6.1 Collar**

The personal flotation device shall be provided with a collar or other suitable means for supporting the head of a floating wearer as specified in 401.6.1.

402.6.2 Ability to withstand impact

Ability to withstand impact shall be as specified in 401.6.3 and 402.6.3.3.

402.6.3 Adjustable belt**402.6.3.1**

The personal flotation device shall have a belt capable of being adjusted to the size of the wearer with a fastening device, and meet the requirements of 402.6.3.2 and 402.6.3.3.

402.6.3.2

The complete belt as fitted to the personal flotation device shall be tested in accordance with Appendix G.

402.6.3.3

The belt shall be fastened in accordance with the manufacturer's instructions and shall withstand without damage and without slippage of adjustment a pull of 890 ± 20 N.

402.6.4 Drainage of water

The personal flotation device shall be designed in such a way that excess water is not retained when the personal flotation device is removed from the water.

402.7 Source of buoyancy

The buoyancy of a personal flotation device shall be derived essentially from materials specified for the source of buoyancy in Part 3 of this Standard. Rigid material shall not be used as a source of buoyancy for children's personal flotation devices. Children's inflatable personal flotation devices must be automatically inflated.

NOTE – It is permissible for the collar to have a different source of buoyancy from that used in the body of the personal flotation device.

402.8 Fittings

Fittings such as trapeze or parachute harnesses, lifeline attachments or windsurfing harnesses may be incorporated into the personal flotation device. They shall be designed so that no thrust or stress is placed on the personal flotation device, but is transmitted direct from the wearer to the fitting. The strength of fittings such as trapeze or parachute harnesses, or lifeline attachments shall be sufficient to sustain a load of 3 ± 0.15 kN. The strength of windsurfing harnesses shall be sufficient to sustain a load of 1.5 ± 0.15 kN. Personal flotation devices incorporating windsurfing harnesses shall be marked as follows:

“The harness attached to this personal flotation device is intended for windsurfing.”

402.9 Visibility at night

402.9.1

The personal flotation device shall include some means of making it visible at night such as retroreflective tape or lights as specified in 401.9. Where retroreflective tape is used it shall be attached at two places on the personal flotation device as high on the jacket as is practical to enable it to be seen when the wearer is in a backward floating position. The tapes shall be in such positions that they are not obstructed by the wearer. The size of each piece shall be greater than or equal to 1875 mm².

402.9.2

The reflectoflective tape shall comply with either:

- (a) The International Maritime Organization Resolution A.658(16) dated 20 November 1989, Annex, Type I and Type II Classification; or
- (b) The requirements, specified in 3.5 of AS 2259.

402.10 Colour

402.10.1 *Personal flotation device colour*

The colour of the upper area of adult and child medium personal flotation devices shall meet the requirements of 401.10.1 excepting that any labels, straps, piping or binding may be any other colour provided that their combined area does not exceed 15 % of the upper area of the front of the personal flotation device.

Personal Flotation Device Colour – Back (where applicable)

The colour of the upper area of adult and child medium personal flotation devices shall meet the requirements of 401.10.1, excepting that any labels, straps, piping or binding may be any other colour provided that their combined area does not exceed 30 % of the upper area of the back of the personal flotation device (excluding the collar).

The upper area shall be defined as the greater of:

- A: The area above 60 % of the length measure from the top of the shoulder, or
- B: The area above the bottom of the armholes.

The colour of children's small and extra-small personal flotation devices shall meet the requirements of 401.10.1.

402.10.2 *Colour fastness*

The colour fastness of the personal flotation device shall comply with the requirement of 401.10.2.

402.11 Strength of neck opening and fastening device or devices

402.11.1

When tested in accordance with Appendix G, the personal flotation device, after it has been assembled and fastened in accordance with the manufacturer's instructions, shall withstand, without damage and without slippage of adjustment of fastening devices, a pull of 890 ±20 N applied in turn across the fastened personal flotation device and to that part of the personal flotation device intended to support the head.

402.11.2 Fastening for children's personal flotation devices

In addition to complying with the relevant requirements of Part 3 of this Standard, fastenings on children's small and extra-small personal flotation devices shall be positioned so that they can be released by an adult in the case of an emergency, but cannot, within reason, be released inadvertently by the child.

402.12 Marking

402.12.1 General requirements

In addition to the requirements of section 316, the personal flotation devices shall be legibly and indelibly marked in a contrasting colour with the following information:

- (a) The words "402/IN-SHORE WATERS PERSONAL FLOTATION DEVICE" conspicuously placed, in block letters not less than 6 mm high. Beneath that, clearly visible the words – "May not be suitable for all conditions – or use where early rescue may be anticipated", and:
 - (i) PFD Adult and child medium:
 - (1) "When worn, this PFD will improve a wearer's chances of survival, but its use does not guarantee your safety and ultimate rescue of the wearer, but will afford support in the water for an extended period
 - (2) The use of this PFD may not hold your head above water if unconscious
 - (3) The effectiveness of your PFD is greatly increased if a crotch strap is fitted to prevent it from riding up over your head"
 - (ii) PFD Child extra small and small:
 - (1) "When worn, this PFD will improve a wearer's chances of survival, but its use does not guarantee your safety and ultimate rescue of the wearer, but will afford support in the water for an extended period
 - (2) The use of this PFD may not hold your head above water if unconscious
 - (3) The crotch strap must always be securely fastened";
- (b) Intended body mass range and chest size;
- (c) Minimum buoyancy;
- (d) Method of donning, securing and adjusting;
- (e) Clear identification of the front and back where any possibility of confusion may exist;
- (f) A warning as follows: "The effectiveness of a personal flotation device is considerably reduced in rough water, breaking seas and surf";
- (g) Number of this Standard and year – e.g. NZS 5823:2005.

402.12.2 Special requirements for children's lifejackets

In addition to the marking specified in (a) to (g) of 402.12.1 and the requirements of section 315, children's personal flotation devices shall be legibly and indelibly marked with the following:

- (a) The words "IN-SHORE PERSONAL FLOTATION DEVICE, CHILD – MEDIUM, SMALL or EXTRA-SMALL" as appropriate, conspicuously placed, in block letters not less than 6 mm high;

- (b) The words “CAUTION: The child wearing this personal flotation device should be under constant supervision”. The text shall be conspicuously placed and the word “CAUTION” shall be in block letters of height not less than 6 mm.

402.12.3 *Marking for In-shore waters personal flotation devices using inflatable chambers as a means of buoyancy*

These personal flotation devices shall be marked as follows where applicable:

- (a) Simple instructions for use (e.g. “Pull red knob to inflate”);
- (b) Where inflated by compressed gas, an instruction to check that the cylinder is fully charged to the weight of the correct charge for rechargeable cylinders or the minimum total weight for full expendable cylinders;
- (c) In the case of partially inherently buoyant personal flotation devices, a statement of the amount of uninflated buoyancy;
- (d) Inflatable and partially inherently buoyant personal flotation devices shall carry a warning to the effect that “This personal flotation device is effective only when fully inflated”;
- (e) For personal flotation devices inflatable by compressed gas a warning in the following terms, “Do not operate gas inflation if already inflated”.

403 BUOYANCY VESTS

403.1 Scope

This section of this Standard sets out the requirements for buoyancy vests intended to be worn on the body to assist flotation during short-term immersion in smooth waters.

403.2 Application

Buoyancy vests shall comply with the requirements of this section in addition to the relevant requirements of Part 3 of this Standard.

403.3 Classification

Buoyancy vests shall be classified in terms of the minimum buoyancy deemed to be adequate for intended wearers, within the ranges of body mass as follows:

Body mass	Wearer
40 kg and over	Adult
22 kg to 40 kg	Child – Medium
12 kg – 25 kg	Child – Small
10 kg to 15 kg	Child – Extra Small

403.4 Minimum buoyancy

When determined in the manner described in Appendix B, the buoyancy of the buoyancy vest shall not be less than the following:

Body mass	Minimum buoyancy
40 kg and over	53 N +10 %*
22 kg to 40 kg	35 N +10 %*
12 kg to 25 kg	22 N +10 %*
10 kg to 15 kg	16 N +10 %*

*As a quality assurance buffer to compensate for variance in inherent buoyancy material batch consistency.

403.5 In-water performance**403.5.2 General**

The distribution of buoyant material shall be such that the vest will safely support the wearer. Any tendency for the wearer to be tilted forward from the vertical in the water shall be considered to be unsafe. (Refer to Appendix L 3.1.2 (d) for test).

403.5.2 Fitting

The buoyancy vest when tested in accordance with Appendix L3.1 shall:

- (a) Have all belts and fastenings able to be closed and adjusted to a snug fit;
- (b) Not become grossly displaced on the wearer, and:
 - (i) Not 'ride up' to such a degree as to cause excessive discomfort to the wearer, or impede respiration
 - (ii) Have no tendency to 'ride up' to such a degree that the potential exists for it to continue over the wearer's head.

403.6 General design**403.6.1 Style**

The design of a vest shall be such that the garment fits over the shoulders or around the neck and around the chest or waist.

403.6.2 Ability to withstand impact

The vest shall meet the requirements of 401.6.3.

403.6.3 Drainage of water

The vest shall meet the requirements of 402.6.4.

403.6.4 Adjustable belt

This shall be as specified for the lifejacket in 402.6.3.

403.7 Source of buoyancy

The buoyancy of the vest shall be derived essentially from materials specified for the source of buoyancy in Part 3 of this Standard with the exclusion of inflatable chambers as the sole source of buoyancy.

403.8 Fittings

Fittings incorporated on the vest shall meet the requirements of 402.8. Buoyancy vests incorporating windsurfing harnesses shall be marked as follows:

"The harness attached to this buoyancy vest is intended for windsurfing."

403.9 Visibility at night

The vest shall comply with the requirements of 401.9.

403.10 Colour

403.10.1 Vest colour

The colour requirements shall be as specified in 402.10.

403.10.2 Colour fastness

The colour fastness of the buoyancy vest to sunlight and salt water shall comply with the requirements of 401.10.2.

403.11 Strength of neck opening and fastening device or devices

403.11.1

The buoyancy vests, after being assembled and fastened in accordance with the manufacturer's instructions, shall withstand, without damage and without slippage of adjustment of fastening devices, the strength of fastening tests in Appendix G.

403.11.2 Fastening for children's buoyancy vests

In addition to complying with the relevant requirements of Part 3 of this Standard, fastenings on children's small and extra-small buoyancy vests shall be positioned so that they can be released by an adult in the case of an emergency, but cannot, within reason, be released inadvertently by the child.

403.12 Marking

403.12.1 General requirements

In addition to the requirements of section 316, buoyancy vests shall be legibly and indelibly marked in a contrasting colour with the following information:

- (a) The words "403/BUOYANCY VEST" conspicuously placed, in block letters not less than 6 mm high. Beneath that, clearly visible the words "May not be suitable for all conditions – for use where early rescue may be anticipated" and:

Buoyancy vest adult and child medium:

- (i) "When worn, this buoyancy vest will improve a wearer's chances of survival, but its use does not guarantee your safety and ultimate rescue of the wearer, but will afford support in the water for an extended period
- (ii) The use of this buoyancy vest may not hold your head above water if you are unconscious
- (iii) The effectiveness of your buoyancy vest is greatly increased if a crotch strap is fitted to prevent it from riding up over your head"

Buoyancy vest child extra small and small:

- (iv) "When worn, this buoyancy vest will improve a wearer's chances of survival, but its use does not guarantee your safety and ultimate rescue of the wearer, but will afford support in the

water for an extended period

(v) The use of this buoyancy vest may not hold your head above water if unconscious

(vi) The crotch strap must always be securely fastened";

(b) Intended body mass range and chest size;

(c) Minimum buoyancy;

(d) Method of donning, securing and adjusting;

(e) Clear identification of the front and back where any possibility of confusion may exist;

(f) A warning as follows: "The effectiveness of a buoyancy aid is considerably reduced in rough water, breaking seas and surf";

(g) Number of this Standard and year – e.g. NZS 5823:2005.

403.12.2 Special requirements for children's lifejackets

In addition to the marking specified in (a) to (g) of 403.12.1 and the requirements of section 315, children's personal flotation devices shall be legibly and indelibly marked with the following:

(a) The words "BUOYANCY VEST, CHILD – MEDIUM, SMALL or EXTRA-SMALL" as appropriate, conspicuously placed, in block letters not less than 6 mm high. Beneath that, the words "May not be suitable for all conditions - for use where early rescue may be anticipated";

(b) The words "CAUTION: The child wearing this buoyancy vest should be under constant supervision". The text shall be conspicuously placed and the word "CAUTION" shall be in block letters of height not less than 6 mm.

404 BUOYANCY-AID WET SUITS

404.1 Scope

This section sets out the requirements for buoyancy-aid wet suits to be worn on the body to assist flotation and to conserve body heat when the wearer is at risk of short-term immersion in water.

404.2 Application

Buoyancy-aid wet suits shall comply with the requirements of this section in addition to the relevant requirements of Part 3 of this Standard.

404.3 Classification

Buoyancy-aid wet suits shall be classified in terms of the minimum buoyancy deemed to be adequate for intended wearers, with the ranges of body mass as follows:

Body mass	Wearer
40 kg and over	Adult
22 kg to 40 kg	Child – Medium

404.4 Minimum buoyancy

When determined in the manner described in Appendix B, the buoyancy above the waist of the buoyancy-aid wet suit shall not be less than the following:

Body mass	Minimum buoyancy
40 kg and over	53 N +10 %*
22 kg to 40 kg	35 N +10 %*

*As a quality assurance buffer to compensate for variance in buoyancy material batch consistency.

404.5 In-water performance**404.5.1 General**

The distribution of wet suit material and extra buoyant material of the buoyancy-aid wet suit shall be as follows:

- (a) Ratio of buoyancy above the waist to buoyancy below the waist. The ratio of buoyancy above the waist to buoyancy below the waist shall be greater than or equal to 2 to 1;
- (b) Above waist ratio of ventral buoyancy to dorsal buoyancy. The above waist ratio of ventral (front) buoyancy to dorsal (back) buoyancy shall be greater than or equal to 3 to 2.

404.6 General design**404.6.1 Ability to withstand impact**

The buoyancy-aid wet suit shall meet the requirements of 401.6.3.

404.6.2 Minimum thermal conductivity and properties of wet suit material

The buoyancy-aid wet suit material shall have physical properties and thermal resistance equivalent to or better than No. 38 neoprene foam when tested in accordance with ASTM C 177 and ASTM C 518 or equivalent tests. The foam shall be a minimum of 3 mm thick.

404.6.3 Adjustable belt

The buoyancy-aid wet suit shall have a belt capable of being adjusted to the size of the wearer.

404.7 Sources of buoyancy

The buoyancy of the buoyancy-aid wet suit shall be derived essentially from materials specified for the source of buoyancy in Part 3 of this Standard as well as the wet suit material.

404.8 Fittings

Fittings incorporated on the buoyancy-aid wet suit shall meet the requirements of 402.8. Buoyancy-aid wet suits incorporating windsurfing harnesses shall be marked as follows:

“The harness attached to this buoyancy-aid wet suit is intended for windsurfing.”

404.9 Visibility at night

The vest shall comply with the requirements of 401.9.

404.10 Colour

404.10.1 *Buoyancy-aid wet suit colour*

The buoyancy-aid wet suit shall contain areas which are coloured according to the requirements of 401.10.1 for open-waters lifejackets. The minimum areas coloured shall include the top half of the back and front above the waist of the wet suit, but the shoulder area may be excluded. The above requirement with respect to area coloured excludes the sleeves. Reflective material of a minimum width of 25 mm shall be used at the top of both shoulders between the neck opening and the top of the sleeves.

404.10.2 *Colour fastness*

The colour fastness of the coloured areas of the buoyancy-aid wet suit to sunlight and salt water shall comply with the requirements of 401.10.2.

404.11 Strength of neck opening and fastening device or devices

404.11.1

The buoyancy vests, after having been assembled and fastened in accordance with the manufacturer's instructions, shall withstand, without damage and without slippage of adjustment of fastening devices, the tests in Appendix G.

404.11.2 *Fastening for buoyancy vests*

In addition to complying with the relevant requirements of Part 3 of this Standard, fastenings on children's small and extra-small buoyancy-aid wet suit shall be positioned so that they can be released in the case of an emergency by an adult, but cannot, within reason, be released inadvertently by the child.

404.12 Marking

404.12.1 *General*

In addition to the requirements of section 316, buoyancy-aid wet suits shall be legibly and indelibly marked in a contrasting colour with the following information:

- a) The words "404/BUOYANCY-AID WET SUIT" conspicuously placed, in block letters not less than 6 mm high. Beneath that, clearly visible the words
"May not be suitable for all conditions – for use where early rescue may be anticipated".
- (b) Intended body mass range and chest size;
- (c) Minimum buoyancy;
- (d) Method of donning, securing and adjusting;
- (e) Clear identification of the front and back where any possibility of confusion may exist;
- (f) A warning as follows: "When worn, this buoyancy aid will improve the chances of survival, but its use does not guarantee the safety and ultimate rescue of the wearer, but will afford support in the water for an extended period. The effectiveness of a buoyancy aid is considerably reduced in rough water, breaking seas and surf";
- (g) Number of this Standard and year – e.g. NZS 5823:2005.
- (h) The words "CAUTION: Buoyancy of the suit relies on a proportion of the buoyancy being positioned in the legs. This should be taken into account when in use."

404.12.2 Special requirements for children's buoyancy-aid wet suits

In addition to the marking specified in (a) to (h) of 404.12.1 and the requirements of section 315, children's buoyancy-aid wet suits shall be legibly and indelibly marked with the following:

- (a) The words "Buoyancy-aid wet suit, CHILD – MEDIUM, SMALL or EXTRA-SMALL" as appropriate, conspicuously placed, in block letters not less than 6 mm high. Beneath that, the words "May not be suitable for all conditions – for use where early rescue may be anticipated".
- (b) The words "CAUTION: The child wearing this buoyancy-aid wet suit should be under constant supervision". The text shall be conspicuously placed and the word "CAUTION" shall be in block letters of height not less than 6 mm.

405 BUOYANCY GARMENTS

405.1 Scope

This section sets out the requirements for buoyancy garments intended to be worn on the body when the wearer is at risk of short-term immersion in water.

405.2 Application

Buoyancy garments shall comply with the requirements of this section in addition to the relevant requirements of Part 3 of this Standard.

405.3 Classification

Buoyancy garments shall be classified in terms of the minimum buoyancy deemed to be adequate for intended wearers, within the ranges of body mass as follows:

Body mass	Wearer
40 kg and over	Adult
22 kg to 40 kg	Child – Medium
12 kg to 25 kg	Child – Small
10 kg to 15 kg	Child – Extra Small

405.4 Minimum buoyancy

When determined in the manner described in Appendix B, the buoyancy of the buoyancy garment shall be not less than the following:

Body mass	Minimum buoyancy
40 kg and over	53 N +10 %*
22 kg to 40 kg	35 N +10 %*
12 kg to 25 kg	22 N +10 %*
10 kg to 15 kg	16 N +10 %*

*As a quality assurance buffer to compensate for variance in buoyancy material batch consistency.

405.5 In-water performance

405.5.1 General

The distribution of buoyant material shall be such that the garment will safely support the wearer. Any tendency for the wearer to be tilted forward from the vertical in the water shall be considered to be unsafe. (Refer to Appendix L 3.1.2 (d) for this test).

405.5.2 Fitting

The buoyancy garment when tested in accordance with Appendix L 3.1 shall:

- (a) Have all belts and fastenings able to be closed and adjusted to a snug fit;
- (b) Not become grossly displaced on the wearer, and:
 - (i) Not 'ride-up' to such a degree as to cause excessive discomfort to the wearer, or impede respiration
 - (ii) Have no tendency to 'ride-up' to such a degree that the potential exists for it to continue over the wearer's head.

405.6 General design

405.6.1 Style

The design of a buoyancy garment shall be such that it is fitted to the body in such a manner that the wearer is supported in water with the head uppermost.

405.6.2 Ability to withstand impact

The garment shall meet the requirements for open-waters lifejackets set out in 401.6.3.

405.6.3 Drainage of water

The garment shall meet the requirements for personal flotation devices set out in 402.6.4.

405.7 Source of buoyancy

The buoyancy of a buoyancy garment shall be derived essentially from materials specified for the source of buoyancy in Part 3 of this Standard.

405.8 Fittings

Fittings attached to the buoyancy garment shall be as set out for personal flotation devices in 402.8. Buoyancy garments incorporating windsurfing harnesses shall be marked as follows:

"The harness attached to this buoyancy garment is intended for windsurfing."

405.9 Visibility at night

The buoyancy garments should meet the requirements of 401.9 where reflectroreflective tape is fitted.

405.10 Colour

405.10.1 Buoyancy garment colour

The buoyancy garments may contain areas which are coloured according to the requirements of 401.10.1 for open-waters lifejackets.

405.11 Strength of neck opening and fastening device or devices

405.11.1

The buoyancy garment, after having been assembled and fastened in accordance with the manufacturer's instructions, shall withstand, without damage and without slippage of adjustment of fastening devices, the tests in Appendix G.

405.11.2 Fastening for buoyancy garments

In addition to complying with the relevant requirements of Part 3 of this Standard, fastenings on children's small and extra-small buoyancy garments shall be positioned so that, in the case of an emergency, they can be released by an adult, but cannot, within reason, be released inadvertently by the child.

405.12 Marking

405.12.1 General

In addition to the requirements of section 316, the buoyancy garment shall be legibly and indelibly marked in a contrasting colour with the following information:

- (a) The words "405/BUOYANCY GARMENT" conspicuously placed, in block letters not less than 6 mm high. Beneath that, clearly visible the words
"May not be suitable for all conditions. - for use where early rescue may be anticipated".
- (b) Intended body mass range and chest size;
- (c) Minimum buoyancy;
- (d) Method of donning, securing and adjusting;
- (e) Clear identification of the front and back where any possibility of confusion may exist;
- (f) A warning as follows: "When worn, this buoyancy aid will improve the chances of survival, but its use does not guarantee the safety and ultimate rescue of the wearer, but will afford support in the water for an extended period. The effectiveness of a buoyancy aid is considerably reduced in rough water, breaking seas and surf";
- (g) Number of this Standard and year - NZS 5823:2005.
- (h) In the case of buoyancy garments which are fully orally inflatable, a warning is to be included on the label as follows: "CAUTION: This buoyancy garment should be partially inflated before entering water".

405.12.2 Special requirements for children's buoyancy garments

In addition to the marking specified in (a) to (h) of 405.12.1 and the requirements of section 315, children's buoyancy garments shall be legibly and indelibly marked with the following:

- (a) The words "BUOYANCY GARMENT, CHILD – MEDIUM, SMALL or EXTRA-SMALL" as appropriate, conspicuously placed, in block letters not less than 6 mm high. Beneath that, the words:
"May not be suitable for all conditions – for use where early rescue may be anticipated";
- (b) The words "CAUTION: The child wearing this buoyancy garment should be under constant supervision". The text shall be conspicuously placed and the word "CAUTION" shall be in block letters of height not less than 6 mm.

406 SPECIALIST PERSONAL FLOTATION DEVICES

406.1 Scope

This section sets out the requirements for personal flotation devices intended for use by specialists in the following water pursuits:

- (a) White-water rafting;
- (b) Jet and power boat racing;
- (c) Kayaking including multi-sport kayaking, white-water kayaking, swift-water kayaking and sea kayaking.

406.2 Application

Specialist personal flotation device shall comply with the requirements of this section and Part 3 of this Standard.

406.3 Classification

Specialist personal flotation devices shall be classified in terms of the minimum buoyancy deemed to be adequate for intended wearers.

406.4 Minimum buoyancy

When determined in the manner described in Appendix B, the buoyancy of the specialist personal flotation device shall be not less than:

- (a) 100 N +10 %* for white-water rafting;
- (b) 100 N +10 %* for jet and power boat racing;
- (c) 50 N +10 %* for kayaking activities.

*As a quality assurance buffer to compensate for variance in buoyancy material batch consistency.

406.5 In-water performance

406.5.1 General

The distribution of buoyant material shall be such that the garment will safely support the wearer. Any tendency for the wearer to be tilted forward from the vertical in the water shall be considered to be unsafe. (Refer to L3.1.2(d) for test).

406.5.2 Requirements

The specialist personal flotation device when tested in accordance with Appendix L shall:

- (a) Have all belts and fastenings able to be closed and adjusted to a snug fit;
- (b) Not become grossly displaced on the wearer;
- (c) Not seriously restrict the wearer's ability to swim.

406.6 General design

406.6.1 Collar

The specialist personal flotation device may be provided with a collar or other suitable means for supporting the head of a floating wearer as set out for open-waters lifejackets in 401.6.1. where required (e.g. jet and power-boat racing).

406.6.2 Ability to withstand impact

The specialist personal flotation device shall be strong enough to withstand without significant damage an impact equivalent to a wearer falling or jumping into the water from a height of 3 ± 0.3 m. In addition, on impact the specialist lifejacket shall not be dislodged or damaged.

406.6.3 Adjustable belt

The specialist personal flotation device may have a belt as set out in 402.6.3.

406.6.4 Drainage of water

The drainage of water from the specialist personal flotation device shall be as set out in 402.6.4.

406.7 Source of buoyancy

The buoyancy of a specialist personal flotation device shall be derived essentially from materials specified for the source of buoyancy in Part 3 of this Standard.

NOTE – It is permissible for the collar (where fitted) to have a different source of buoyancy from that used in the body of the jacket.

406.8 Fittings

Fittings attached to the specialist personal flotation device shall be as set out in 402.8.

406.9 Visibility at night

The specialist personal flotation device is not intended for use at night and is marked accordingly.

406.10 Colour

The colour of a specialist personal flotation device shall be as set out in 402.10.

406.11 Strength of neck opening and fastening device or devices

The strength of the neck opening and fastening device of the specialist personal flotation device shall be as set out in 402.11.

406.12 Marking

406.12.1 General requirements

In addition to the requirements of section 316, the specialist personal flotation device shall be legibly and indelibly marked in a contrasting colour with the following information:

- (a) The words “406/SPECIALIST PERSONAL FLOTATION DEVICE FOR.....” conspicuously placed, in block letters not less than 6 mm high. The blank space shall contain the use for which the jacket is designed. Beneath that, the words ““May not be suitable for all conditions - for use where early rescue may be anticipated”.

The words “FOR USE DURING DAYLIGHT HOURS ONLY” conspicuously placed, in block letters not less than 6 mm high is required for specialist personal flotation device designed for daytime use where these do not meet the requirements of 401.9; and:

- (i) Specialist PFD Adult and child medium:
 - (A) "When worn, this specialist PFD will improve a wearer's chances of survival, but its use does not guarantee your safety and ultimate rescue of the wearer, but will afford support in the water for an extended period
 - (B) The use of this specialist PFD may not hold your head above water if unconscious
 - (C) The effectiveness of your specialist PFD is greatly increased if a crotch strap is fitted to prevent it from riding up over your head";
- (ii) Specialist PFD Child extra small and small:
 - (A) "When worn, this specialist PFD will improve a wearer's chances of survival, but its use does not guarantee your safety and ultimate rescue of the wearer, but will afford support in the water for an extended period
 - (B) The use of this specialist PFD may not hold your head above water if unconscious
 - (C) If fitted, the crotch strap must always be securely fastened";
- (b) Intended body mass range and chest size;
- (c) Minimum buoyancy;
- (d) Method of donning, securing and adjusting;
- (e) Clear identification of the front and back where any possibility of confusion exists;
- (f) A warning as follows: "The effectiveness of a personal flotation device is considerably reduced in rough water, breaking seas and surf";
- (g) Number of this Standard and year – e.g. NZS 5823:2005.

406.12.2 *Special requirements for children's specialist personal flotation devices*

In addition to the marking specified in (a) to (g) of 406.12.1 and the requirements of section 315, children's specialist personal flotation device shall be legibly and indelibly marked with the following:

- (a) The words SPECIALIST PERSONAL FLOTATION DEVICE, CHILD – MEDIUM, SMALL or EXTRA-SMALL" as appropriate, conspicuously placed, in block letters not less than 6 mm high. Beneath that, the words –
"May not be suitable for all conditions - for use where early rescue may be anticipated".
- (b) The words "CAUTION: The child wearing this specialist personal flotation device should be under constant supervision". The text shall be conspicuously placed and the word "CAUTION" shall be in block letters of height not less than 6 mm.

406.12.3 *Marking for specialist personal flotation device using inflatable chambers as a means of buoyancy*

These jackets shall be marked as follows where applicable:

- (a) Simple instructions for use (e.g. "Pull red knob to inflate");
- (b) Where inflated by compressed gas, an instruction to check that the cylinder is fully charged; the weight of the correct charge for rechargeable cylinders or the minimum total weight for full expendable cylinders;

- (c) In the case of a partially inherently buoyant specialist personal flotation device, a statement of the amount of uninflated buoyancy;
- (d) Inflatable and partially inherently buoyant personal flotation devices shall carry a warning to the effect that "This personal flotation device is effective only when fully inflated";
- (e) For a specialist personal flotation device inflatable by compressed gas a warning in the following terms – "Do not operate gas inflation if already inflated".

PART 5 RESCUE BUOYS

501 SCOPE

501.1

This section sets out the requirements for rescue buoys intended to be thrown or dropped to a person in water to assist in effecting rescue. It does not apply to lifebuoys required to be carried by commercial vessels.

502 APPLICATION

Rescue buoys shall comply with the requirements of this section in addition to the relevant requirements of Part 3 of this Standard.

503 GENERAL DESIGN REQUIREMENTS

503.1 Minimum buoyancy

When determined in the manner described in Appendix B, the buoyancy of the rescue buoy shall be not less than 125 N.

503.2 Design

The rescue buoy shall be of rigid or semi-rigid construction to facilitate throwing and shall be fitted with beackets or hand-holds. It shall be of such shape as will enable it to be easily grasped by a person in the water. It shall have provision for the fitting of a rescue line and have no sharp edges. It may be fitted with a light or marker.

NOTE – Where a rescue buoy is fitted with a rescue line, the line should be not less than 20 m long, not less than 5 mm in diameter, have a breaking strength not less than 3 kN and be capable of floating.

503.3 Mass

503.3.1 Range

A rescue buoy shall have a mass within the range of 1 kg to 6 kg.

503.3.2 Nominal density

Self-inflatable rescue buoys designed to be thrown uninflated and to inflate automatically on contact with water shall have a nominal density of not less than 160 kg/m³ in the as-thrown uninflated state. The nominal density D shall be calculated as follows:

$$D = \frac{M}{V}$$

where

M = The mass of the buoy as thrown, kg

V = The volume contained by a surface enclosing the as-thrown buoy, m³.

503.4 Drop test for rigid rescue buoy

A rigid rescue buoy shall withstand, without visible damage, an edgewise vertical drop on to a concrete surface from a height of 2 m -0+100 mm.

503.6 Colour

503.6.1 *Colour of rescue buoy*

The predominant colour of the rescue buoy when immersed in water shall meet the requirements of 401.10.1 as for open-waters lifejackets.

503.7 Marking

The rescue buoy shall meet the requirements of section 316.

PART 6

FLOAT-OFF BUOYANCY AIDS

601 SCOPE

601.1 General

This section sets out the requirements for buoyancy aids intended to be carried in small boats and to float free in order to assist flotation of survivors during short-term immersion.

602 APPLICATION

Float-off buoyancy aids shall comply with the requirements of this section in addition to the relevant requirements of Part 3 of this Standard.

603 GENERAL DESIGN REQUIREMENTS

603.1 Minimum buoyancy

When determined in the manner described in Appendix B, the buoyancy of the float-off buoyancy aid shall be not less than 53 N.

603.2 Design

The float-off buoyancy aid shall be designed to be carried loose in a small boat.

603.3 Source of buoyancy

The buoyancy of a float-off buoyancy aid shall be derived essentially from materials specified for the source of buoyancy in Part 3 of this Standard except that neither kapok nor inflatable chambers shall be used as a source of buoyancy for buoyancy cushions.

603.4 Fittings

603.4.1 General

Any fittings incorporated in the float-off buoyancy aid shall be of sufficient size and strength for their intended function.

603.4.2 Hand-holds

603.4.2.1 Size and placement

Hand-holds shall be sufficiently large for the hand of an adult male to be inserted and should be fitted on all extremities and sides of the float-off buoyancy aid. Hand-holds shall not be recessed into the side of the aid.

603.4.2.2 Specific size

That portion of a hand-hold intended to be gripped by the hand shall be not more than 25 mm diameter. If manufactured from materials of cross-section other than round, the dimensions shall be such as to provide a hand-hold which will not exceed 25 mm in any direction when gripped.

603.4.3 Rescue line attachments

Rescue line attachments, if fitted, shall be of sufficient strength to withstand a minimum pull of 3 kN. (Refer to 503.2).

603.5 Marking

The float-off buoyancy aid shall be legibly and indelibly marked in a contrasting colour to that of the aid with the following information in addition to that required in section 316:

- (a) The words “FLOAT-OFF BUOYANCY AID”;
- (b) The words “DO NOT ATTACH TO BOAT”;
- (c) Minimum buoyancy.

PART 7 MARINE SAFETY HARNESSES AND LINES

701 SCOPE

701.1 General

This Part of this Standard sets out specific requirements for marine safety harnesses and lines.

702 GENERAL DESIGN REQUIREMENTS

702.1 Safety harness and line

702.1.1

The safety harness shall consist of an arrangement of webbing straps and shall be designed to locate the safety line at the level of the centre of the chest of wearers of different body size. The safety harness shall be adjustable to permit it to be worn on the outside of light or heavy sea clothing.

702.1.2

The main load-bearing strap or straps of the safety harness shall not be less than 40 mm in width and brace straps shall not be less than 20 mm in width. The adult safety line should be designed to be detachable from the safety harness by the wearer.

702.1.3 *Safety line overload indicator*

Safety lines should be fitted with an overload indicator between each pair of attachment points. The load rating of each overload indicator should be $600\text{N} \pm 100\text{N}$.

702.1.4 *Length of adult safety line*

The adult safety line shall not be more than 2000 mm in length but may be if a third hook is incorporated (tri-tether) but no length shall exceed 3000 mm including the centre hook. It is recommended that a short and long tether when produced as a tri-tether has legs 1400 mm and 700 mm respectively.

702.1.5 *Length of safety line for children*

The safety line for children, inclusive of fittings, shall be from 1.0 m to 1.5 m in length. The harness shall fit children having chest measurements of between 50 cm and 82 cm.

702.2 Securing buckles

702.2.1

Where securing buckles are provided, they shall be designed so that either:

- (a) They can be fastened only in the correct manner; or
- (b) If they are capable of being fastened in more than one way, all methods of fastening will provide equal security.

Means shall be provided for restraining the free end of any webbing that protrudes from a securing buckle.

NOTE – This requirement is not intended to prohibit the use of D-ring type securing buckles.

702.2.2 *Buckles on harnesses for children*

Any securing buckles on a harness for a child, in addition to the requirements in 702.2, shall not be able to be released by a child up to six years of age and shall not be subject to inadvertent release.

703 MATERIALS

703.1 Webbing straps

Webbing used in the manufacture of main load-bearing and brace straps for safety harnesses shall meet the requirements of AS 1753 (NZS 5432).

703.2 Safety line

The safety line shall be either:

- (a) A nylon filament rope that complies with the requirements of AS 4142.1, AS 4142.2, AS 4143.1 and has a diameter of not less than 10 mm and a breaking force of not less than 22.1 kN; or
- (b) A webbing belt that complies with the requirements of AS 1753 (NZS 5432) and is not less than 38 mm in width; or
- (c) A webbing belt of tubular design (with locking stitch) which is 25 mm in width (50 mm in circumference) with a breaking strain of not less than 22.1 kN.

703.3 Thread

Thread shall comply with the relevant requirements of Part 3 of this Standard.

703.4 Fittings

All fittings shall be smoothly finished, free from any defect caused by faulty material or manufacture, and adequately protected against corrosion. Unless made of stainless steel, metal fittings shall be electroplated with nickel and chromium in accordance with service condition number 4 of AS 1192; alternatively aluminium fittings shall comply with grade AA15 or higher of BS 12373.1.

703.5 Hooks

Hooks shall be quick action preferably self-locking and closing on the boat end of the attachment. The opening of the hook shall be sufficiently large to accept and close fully around a metal cylinder 12.5 mm in diameter. Any spring component shall be capable of being readily cleaned. It is recommended, that the attachment of the line to the harness be such that the hook be able to be released under load in an emergency, by way of a snapshackle that need not be self closing. The snapshackle shall be stainless steel and have a breaking load exceeding 22.1 kN.

703.6 Castings

Where metal castings are used as load-bearing components, they shall be made by the investment casting process as specified in BS 3146.

703.7 Strength of components other than webbing

703.7.1 Minimum tensile force

Every component, other than webbing, shall be capable of withstanding a minimum tensile force as follows:

- (a) Webbing adjusters fitted to secondary straps: 2 kN when wet, before continuous webbing slip occurs;
- (b) Webbing adjusters fitted to primary straps: 7 kN when wet, before continuous webbing slip occurs;
- (c) Other fittings fitted to primary straps: 15 kN before breaking;
- (d) Fittings fitted to secondary straps: 2 kN when wet, before breaking;

- (e) Stitching of any primary strap: 15 kN before breaking.

NOTE – See section 102 for definitions of primary and secondary straps and components and continuous webbing slip.

703.7.2

The application of the tensile force shall reproduce as closely as practicable the manner in which the component is loaded in use on the harness.

703.8 Non-magnetic properties

No metal part of parts of the safety harness or safety line shall deflect a magnetic compass by more than 1° when tested in accordance with Appendix M.

704 SEWING AND SPLICING

704.1 Sewing

All sewing shall be carried out on a lockstitching machine and be securely finished off by back-sewing for at least six stitches, except that where sewn by an automatic lockstitching machine the first and last stitches shall be sewn in such a way as not to provide a natural point for a break in the stitching. Sewing shall not be carried out within 3.0 mm of any edge of the material. This does not exclude oversewing of sealed ends.

704.2 Splicing

704.2.1 *Splices in rope safety lines*

Splices in rope safety lines shall consist of four full tucks and two tapered tucks. The length of the splicing tails shall be not less than three rope diameters from the emergence of the final tuck.

704.2.2 *Splice whippings*

Splices shall be whipped with a suitable man-made fibre twine or shall be protected by other suitable means. Whippings shall cover the entire tapered portion of the splice and tails, and also at least half of the full tuck section. Other means of protection shall cover at least the tapered portion of the splice and the tails.

704.2.3 *Tucks*

Splices may be whipped with a palm and needle whipping over the last tuck, in which case the splice shall consist of four full tucks. A description of palm and needle whipping is given in Appendix N.

705 PERFORMANCE REQUIREMENTS

705.1 Assembly requirements

When tested in accordance with Appendix A, the complete assembly shall meet the following requirements:

- (a) No single component of the assembly shall become ineffective or inoperative or show signs of material failure;
- (b) The slipping of webbing through any one adjusting device shall not exceed 25 mm;
- (c) The angle formed between the spine of the dummy and the safety line shall not exceed 45° when the dummy has come to rest at the conclusion of the test;
- (d) The attachment of fittings and the making of splices and joins in the material of the harness shall be unaffected;

- (e) If the safety line is an integral part or permanently attached to the harness, it shall not prevent removal of the harness;
- (f) The webbing arrangement shall prevent possible constriction to the neck;
- (g) If a hook is used to secure the lifeline to the harness it is placed so that it does not strike the face.

705.2 Safety harness attached to a buoyancy aid

If a safety harness is manufactured as a combination of harness and buoyancy aid the complete assembly shall meet all the relevant requirements of this Standard.

705.3 Assembly of parts

All securing buckles (that is, buckles other than those used primarily for the adjustment of fit), shall be designed so that either they can only be assembled in the correct manner or, if they are capable of assembly in more than one way, each method of assembly shall provide equal security.

706 INFORMATION TO BE SUPPLIED BY THE MANUFACTURER

706.1 Printed instructions

Each safety harness and line offered for sale shall be accompanied by printed instructions bearing words to the following effect:

- (a) The wearer should hook onto a strong anchorage point at all times;
- (b) The safety harness and line should be kept clean, dry and free from oil or grease. Wash in clean fresh water after use;
- (c) The safety harness and line should frequently be inspected for signs of deterioration;
- (d) The safety harness and line should be replaced if they have been subjected to a severe load;
- (e) If it is intended to wear a safety harness and line in conjunction with a buoyancy aid, users are advised to try them on together to ensure that one does not interfere with the function of the other, and in particular, that in use the line is not likely to foul the buoyancy aid;
- (f) Knots and bights in the safety line should be avoided as they weaken the strength of the line;
- (g) The safety line should be kept as short as practicable;
- (h) Any pull on the safety harness should be a direct pull and not be deflected in any way by a fitting;
- (i) Instructions for adjusting and wearing the harness shall be supplied. These should include an appropriate instruction such as "Adjust to fit the wearer as tightly as possible".

706.2 Records

Recommendations for record keeping, storage, examination and maintenance shall be given in accordance with Appendix O.

706.3 Children's harnesses

For children's harnesses, an instruction to the effect that "This is a safety device when used correctly will prevent a child from going overboard. It is not designed to restrain a child against its will".

707 MARKING

707.1

In addition to the requirements of section 316, safety harnesses supplied with detachable safety lines shall have the information required in section 316 clearly and indelibly marked on both the safety harness and on the safety line.

707.2

For children's safety harnesses, the size of the harness shall be marked.

APPENDIX A

PERFORMANCE TEST OF MARINE SAFETY HARNESSSES

(Normative)

A1 SCOPE

This Appendix describes a method for determining the resistance to breakage or other damage under load of a marine safety harness and line for adults and children.

A2 PRINCIPLE

The safety harness and safety line are attached to a dummy which is then positioned in a quick-release device. The safety line is anchored at a position that will allow the dummy to fall freely through 1.5 m $\pm$ 80 mm when the quick-release device is operated.

A3 APPARATUS

A rigid dummy shall have a mass of 136 kg $\pm$ 10 kg $-$ 0 kg for the adult size and a mass of 36 kg $\pm$ 3 kg $-$ 0 kg for the child size. Each dummy shall be of the dimensions shown in figures A1 and A2. The dummies shall be constructed with stub limbs and be designed so that the centre of gravity approximates that of the child or adult.

A4 PROCEDURE

The procedure shall be as follows:

- (a) Thoroughly wet the safety harness and safety line and attach the harness to the dummy exactly as it would be attached to a human wearer, and secure the line to a rigid and robust anchorage;
- (b) Raise the dummy in an upright posture and hold it in position by a quick-release device in such a way that the anchorage of the safety line and the point of attachment of the safety line to the harness are as close as possible in the same vertical axis;

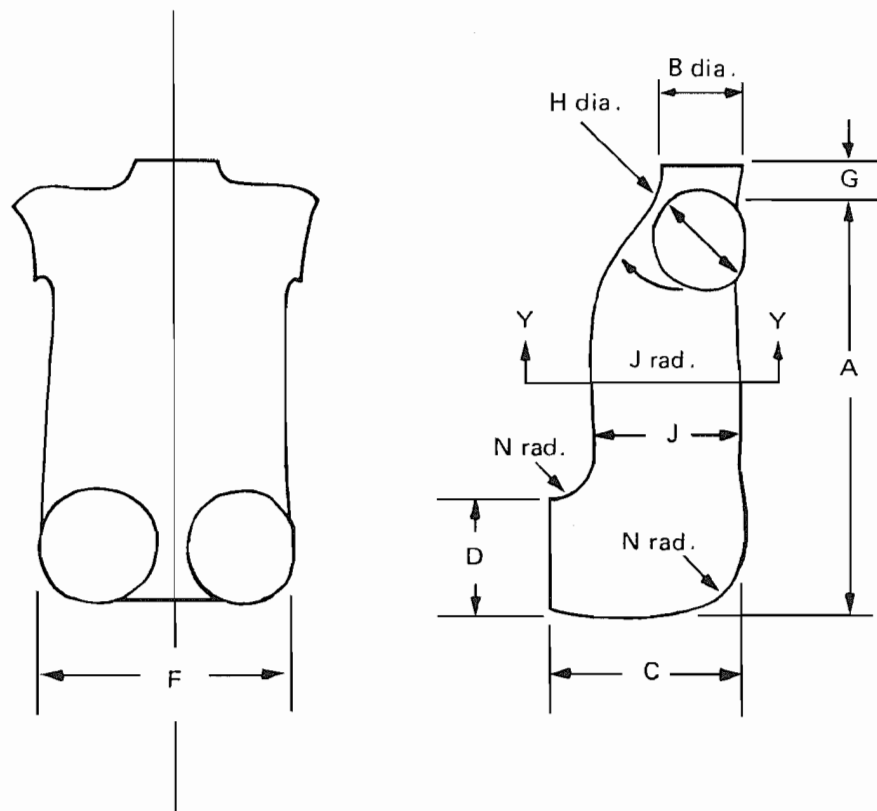
The safety line, which shall be 1.5 m $\pm$ 5 mm in length and for the purposes of the test the two points shall be in the same horizontal axis (see figure A3). The length of the line shall be measured from the inside end of any fittings attached to each end of the safety line;

- (c) Operate the quick-release device and allow the dummy to fall freely.

A5 REPORTING TEST RESULTS

The following shall be reported:

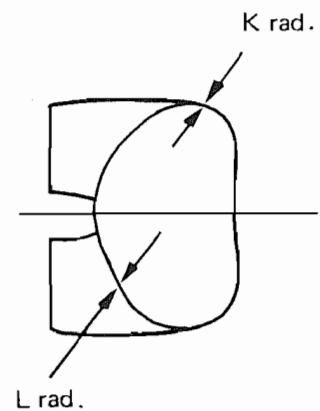
- (a) Whether any single component of the assembly became ineffective or inoperative or showed signs of failure;
- (b) The length the webbing slipped through each of the adjusting devices;
- (c) The angle formed between the spine of the dummy and the safety line when the dummy came to rest at the conclusion of the test;
- (d) Whether any fitting attachment, splice or join was affected;
- (e) Whether the attachment of the safety line prevented removal of the harness;
- (f) Whether the webbing arrangement caused possible constriction of the neck;
- (g) Whether any hook used to secure the safety line to the harness was placed so that it could strike the face.



Millimetres

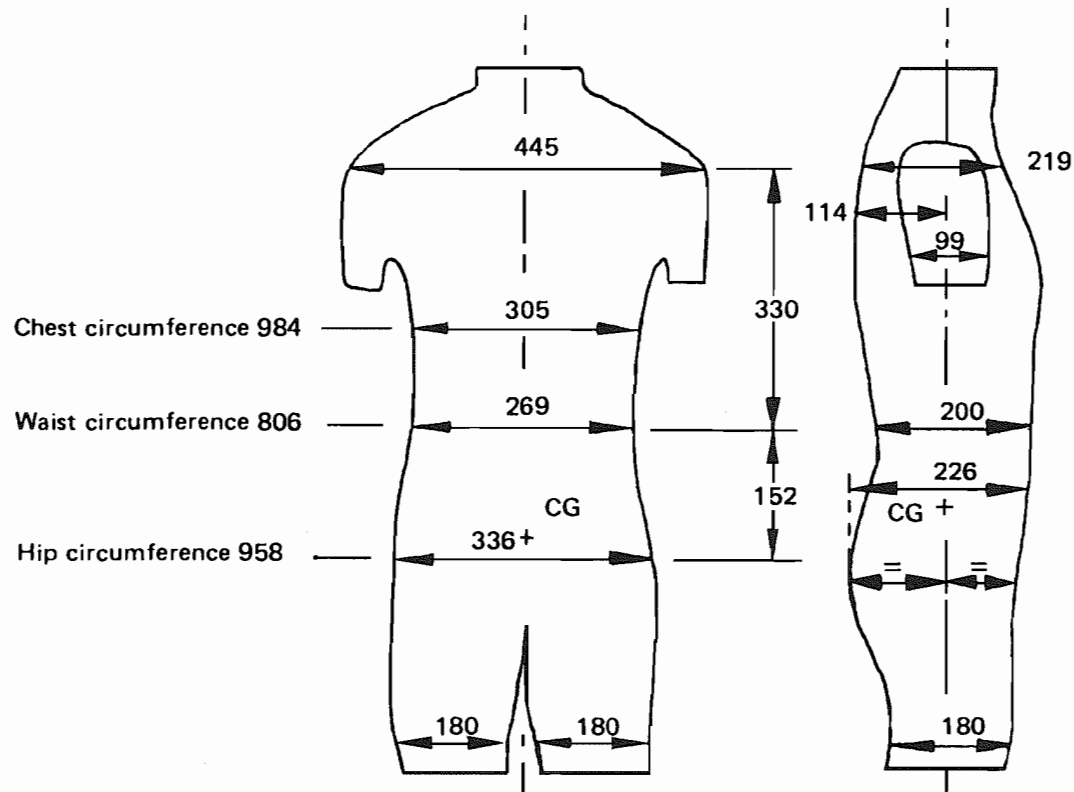
A	= 533
B	= 114
C	= 228
D	= 152
E	= 432
F	= 305
G	= 63
H	= 108
J	= 165
K	= 51
L	= 165
M	= 76
N	= 51

(Tolerances on lengths are $\pm 5\%$.)



Section YY

Figure A1 – Dummy for testing child's harness and safety line



All dimensions are in millimetres.

(Tolerances on dimensions are $\pm 5\%$.)

Figure A2 – Dummy for testing adult harness and safety line

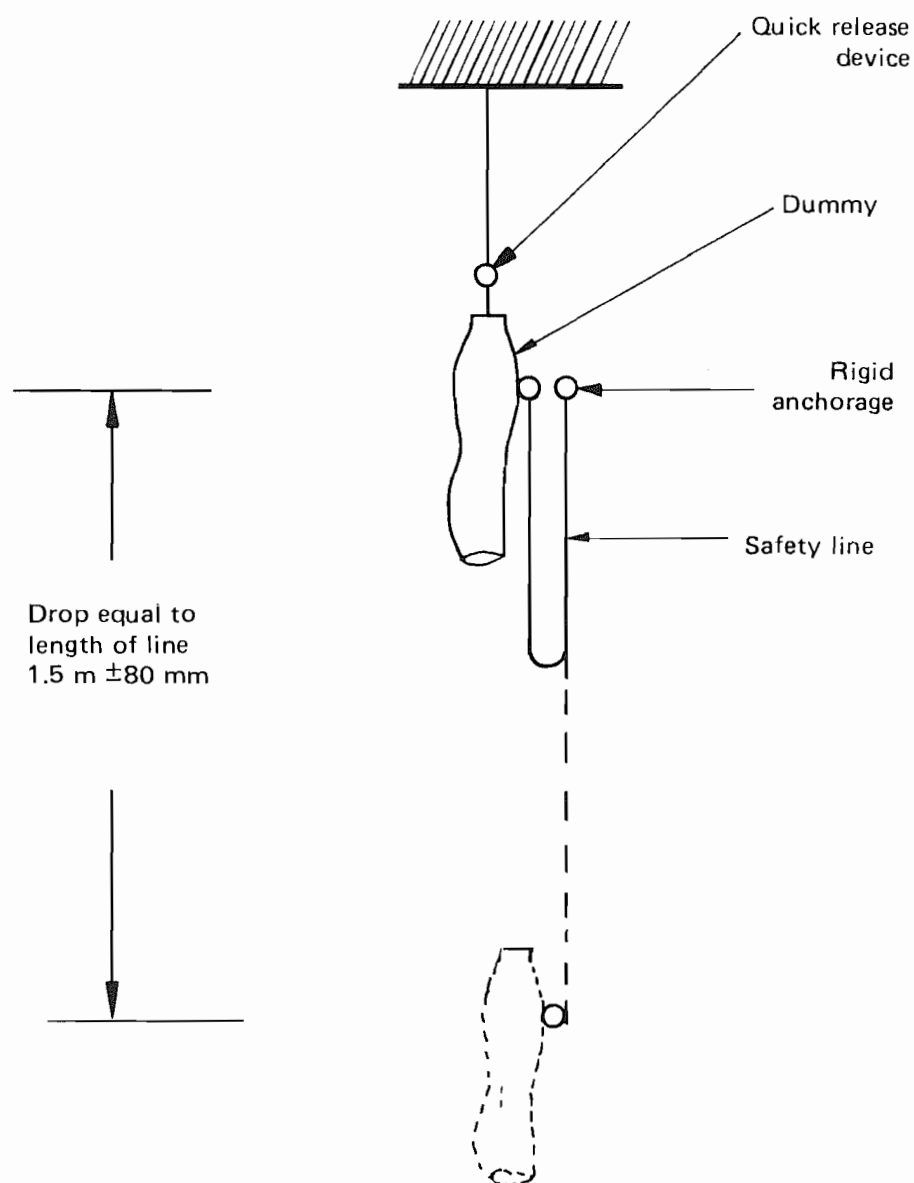


Figure A3 – Position of dummy for testing

APPENDIX B

METHOD FOR THE DETERMINATION OF BUOYANCY

(Normative)

B1 SCOPE

This Appendix describes the method for determining the buoyancy of a buoyancy aid.

B2 APPARATUS

The following apparatus is required:

- (a) A suitable spring balance accurate to ± 0.25 kg;
- (b) A wire-mesh cage large enough to contain the buoyancy aid under test;
- (c) A tank, containing fresh water, large enough to allow the cage containing the buoyancy aid or its components to be submerged without causing overflow of water;
- (d) Weights for the cage if necessary (see B3);
- (e) A rig with suitable lifting tackle for positioning the cage in or out of the water.

B3 PROCEDURE

The test procedure shall be as follows:

- (a) Suspend the cage in the tank so that it is completely submerged in the water. Add weights to the cage where necessary so that the submerged mass of the total suspension is 18 ± 1.8 kg. Record the submerged mass to the nearest 0.05 kg and record it as m_1 ;
- (b) Raise the cage above the water surface and place the buoyancy aid under test inside the cage, except for the following:
 - (i) For buoyancy aids of the inherent-buoyancy type with buoyant material incorporated in pockets formed by an outer covering which is impervious to water, slit open the pockets first and remove the buoyant material. Place all of the components of the buoyancy aid inside a muslin bag, and then place the bag inside the cage
 - (ii) For buoyancy aids of the inflatable type with buoyancy chambers that rely on manual operation of the gas cylinder, inflate the buoyancy aid by the cylinder in accordance with the manufacturer's instructions. Then place the inflated buoyancy aid inside the cage
 - (iii) For buoyancy aids using kapok as the sole source of buoyancy, subject them in their completed form to the test in (i) above. The buoyancy requirements shall be met in both configurations
 - (iv) For buoyancy aids of the inflatable type with buoyancy chambers that rely on oral inflation, inflate the buoyancy aid in accordance with the manufacturer's instructions. Then place the inflated buoyancy aid inside the cage;
- (c) Submerge the cage and contents, taking care to ensure that no air is entrapped within any of the components. The top of the cage shall be at least 50 mm below the surface of the water. Twenty-four hours later, note the mass of the submerged cage and contents to the nearest 0.05 kg and record it as m_2 .

B4 CALCULATION AND REPORT**B4.1**

Record to the nearest 0.1 kg the difference in mass ($m_1 - m_2$) between the submerged empty cage and the submerged cage containing the buoyancy aid.

B4.2

Calculate and report the buoyancy in newtons of the buoyancy aid, using the following formula:

$$\text{Buoyancy} = (m_1 - m_2) \times 9.8$$

APPENDIX C

METHOD FOR TESTING RESISTANCE TO PUNCTURING

(Normative)

C1 SCOPE

This Appendix describes the method for testing the inflatable chamber of a buoyancy aid for resistance to puncturing.

C2 APPARATUS

The following apparatus is required:

- (a) A test point of steel conforming to the dimensions shown in figure C1;
- (b) Means of applying the point at a controllable uniform rate with the measurable force to a test surface.

C3 PROCEDURE

C3.1 For air cells

C3.1.1 Puncture test

The inflated chamber shall be placed on an even surface and the test point pressed against the inflated chamber at such a speed, which shall be uniform, that puncturing occurs within 15 s to 25 s after the point has touched the surface of the cell. The puncturing force shall then be recorded.

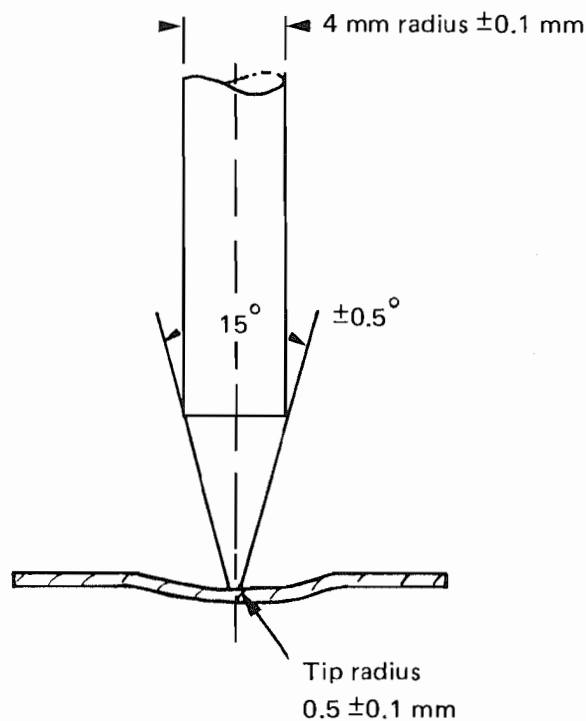


Figure C1 – Test point

C3.1.2 *Complying via puncture resistance*

If no puncturing has occurred before becoming fully compressed, or before the point has caused the upper and lower walls to come into contact, the test shall be discontinued without any measurement being made. In such cases, the inflated chamber shall be deemed to comply with the requirements of 305.3.3.

C3.2 **For inflatable buoyancy aids**

The buoyancy aid shall be inflated in accordance with the manufacturer's instructions for use. The gas cylinder shall be charged with not less than the minimum mass of gas (see 309.7(g)(ii)). The puncturing test shall then be performed as described above in C3.1.

C4 **REPORT**

The report shall state whether or not puncturing occurred, and, if so, the puncturing force required.

APPENDIX D

METHOD FOR TESTING AIR POROSITY

(Normative)

D1 SCOPE

This Appendix describes the method for testing coated fabrics used for the inflatable chamber of a buoyancy aid for air penetration (porosity).

D2 APPARATUS

The apparatus is shown in figure D1.

D3 PREPARATION OF TEST SPECIMEN

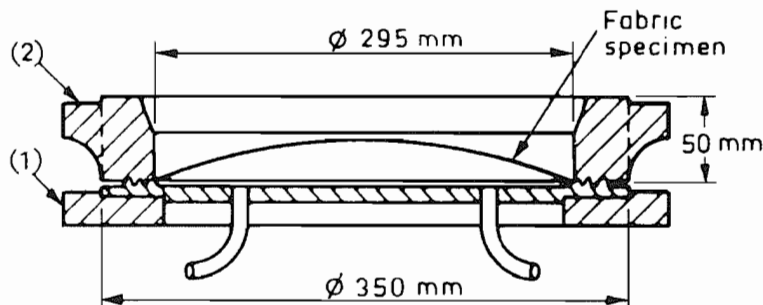
D3.1 Temperature test

The specimen shall be exposed to ambient conditions for 24 ± 1 hr before testing and shall be tested at a temperature of not less than 19°C .

D3.2 Wax test

A disc 350 ± 10 mm in diameter shall be cut from the test sample and sealed at the periphery on both surfaces and the edge by dipping in molten wax to leave a wax-free central test area $295 -0 +5$ mm in diameter.

NOTE – A mixture of 3.5 parts petroleum jelly and 1 part beeswax is suitable.



- (1) Baseplate with air inlet and connection to gauge, having grooved margin for clamping.
 - (2) Grooved mating clamping ring having sufficient depth to permit flooding of specimen with water.
- The fabric may be gripped tightly between the clamping ring and baseplate by the use of G-clamps. Alternatively the ring and baseplate may have eight equally spaced lugs cast on them, drilled to take bolts.

Figure D1 – Apparatus for testing air porosity

D4 PROCEDURE

The procedure shall be as follows:

- (a) When the wax is set, clamp the specimen, with the outer face uppermost, firmly in the apparatus;
- (b) Apply and maintain, beneath the fabric, an air pressure of 27.5 ± 1.0 kPa;
- (c) Not less than 10 min nor more than 15 min after the pressure has become steady, flood the fabric with water so that the crown of the bulge is immersed to a depth of about 13 mm;
- (d) Allow to stand for 1 min and then brush the surface all over with a fairly soft brush to remove adhering air bubbles;
- (e) Record zero time and observe for bubbles, if any, breaking the surface of the water in 5 min;
- (f) If the test specimen contains a single site leak, disregard the result, repeat the test on two further specimens from the same piece and report the occurrence.

D5 REPORT

Report whether any bubbles broke the surface of the water in 5 min.

APPENDIX E

METHOD FOR TESTING STATE OF VULCANIZATION

(Normative)

E1 SCOPE

E1.1 General

This Appendix describes the method for testing the state of vulcanization of rubber-coated fabrics used as the wall of the inflatable chamber of a buoyancy aid.

E1.2 Intended proofing samples

This method is intended for natural rubber proofings and is qualitative only; the method is for self-cured and heat-cured samples.

E2 REAGENT

The reagent xylene is required.

E3 PROCEDURE

The procedure shall be as follows:

- (a) Allow 3 or 4 drops of xylene to fall from a glass rod, pipette or bottle on to an area of about 650 mm² of the rubber surface of the proofed coating and of any interplies after exposure by peeling apart;
- (b) Observe the manner in which the solvent spreads, and leave it for 1 to 2 min. On satisfactorily cured rubber the solvent will spread rapidly and will be quickly absorbed leaving a velvety surface, generally bearing the imprint of the textile weave, which will not be obliterated by vigorous rubbing. The proofing does not become tacky and will not adhere to the finger even under heavy pressure.

When the proofing is uncured or undercured the xylene will spread slowly, or not at all, and is not rapidly absorbed by the rubber. After being left for a minute, the rubber in contact with the solvent will be locally swollen, and soft and tacky to the touch. Finally the treated area will stick to the finger under light pressure.

E4 REPORT

The report shall state whether the test indicates that the rubber proofing has satisfactorily cured.

APPENDIX F

STITCHING TO BE USED IN BUOYANCY AID FABRICATION*

(Normative)

F1 STICH TYPE

This type of stitch, as shown in figure F1 shall be formed with two threads; one needle thread, A, and one bobbin thread, B. A loop of thread A shall be passed through the material and interlaced with thread B. Thread A shall be pulled back so that the interlacing shall be midway between the surfaces of the material or materials being sewn.

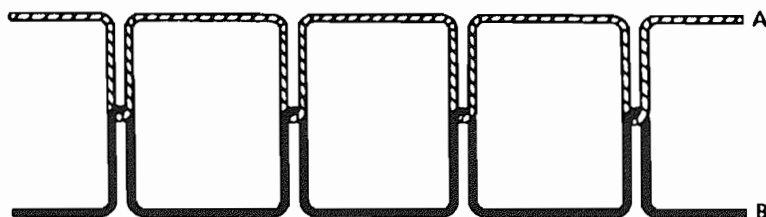


Figure F1 – Stitch type 301

*The illustration and description of the lock-stitch are taken from BS 3870.

APPENDIX G

METHOD OF TESTING STRENGTH OF FASTENING DEVICE OR DEVICES

(Normative)

G1 SCOPE

This Appendix describes the method for testing the strength of the fastening device or devices on a buoyancy aid.

G2 APPARATUS

The following apparatus is required:

- (a) A weight or other means of applying the specified test force;
- (b) A suitable rig for suspending the buoyancy aid and the mass;
- (c) Suitable grips, slings or bars as appropriate to apply the test load to the buoyancy aid. The grips, slings or bars shall be such that they will not damage the buoyancy aid under the applied load.

G3 PROCEDURE

G3.1 Test procedure

The test procedure shall be as follows:

- (a) Fasten the buoyancy aid in accordance with the manufacturer's instructions, with any adjustment for size adjusted to the intermediate position;
- (b) Suspend the buoyancy aid on a sling or bar in such a position that the applied load is transmitted, approximately evenly, through the fastening devices. Where the style of the buoyancy aid precludes the use of slings or bars, suitable grips shall be used.

NOTE – A typical arrangement is shown in figure G1.

- (c) Apply the test force to the lower portion of the buoyancy aid by suitable means, without shock, for 5 min $\pm$ 30 s and remove;
- (d) Examine the buoyancy aid for evidence of damage. In particular, scrutinize seams and observe fastenings for evidence of damage or slippage.

G3.2 Test in each plane

Where buoyancy aids are provided with fastening devices in different planes, the test shall be applied in each plane.

G3.3 Neck opening strength

For buoyancy aids, the strength of the neck opening shall also be tested by applying the load with the jacket supported either by a sling or bar through the neck opening, or by grips affixed to that part of the jacket intended to support the head.

G4 REPORT

The report shall state whether any damage to the fastening device or devices or slippage of adjustment was observed.

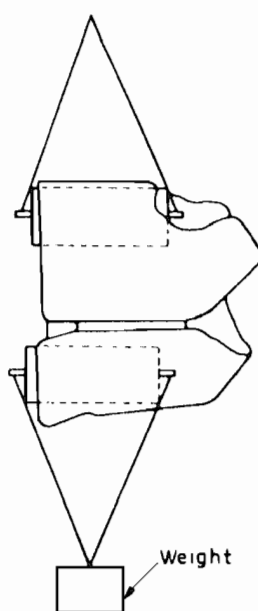


Figure G1 – Typical arrangement for the test of strength of fastening devices test

APPENDIX H METHOD FOR TESTING RESISTANCE TO INADVERTENT OPERATION OF AUTOMATIC INFLATION DEVICES

(Normative)

H1 SCOPE

This Appendix describes the method for testing the resistance to inadvertent operation of automatic inflation devices on buoyancy aids.

H2 APPARATUS

The apparatus shall be as shown in figure H1 and shall consist of the following:

- (a) A free-standing metal box of the dimensions shown, panelled on all sides except the front which is half-panelled to allow for observation;
- (b) Twelve water sprays pointing inwards, fitted in the positions indicated.

In the middle of the back face of the box, a circle 60 ± 1 cm in diameter shall be painted and each of the sprays 1 to 9 shall be adjusted so that a jet from it completely covers this circle. Each spray shall be capable of delivering not less than 220 L of water per hour and shall have a cone-type jet with an included angle of not more than 60° . Sprays 10, 11 and 12 shall be positioned so that their jets intersect at approximately the mid-point of the face area of the box at a position 30 ± 1 cm from the back face. Suitable holes shall be provided in the bottom of the box to permit the escape of water.

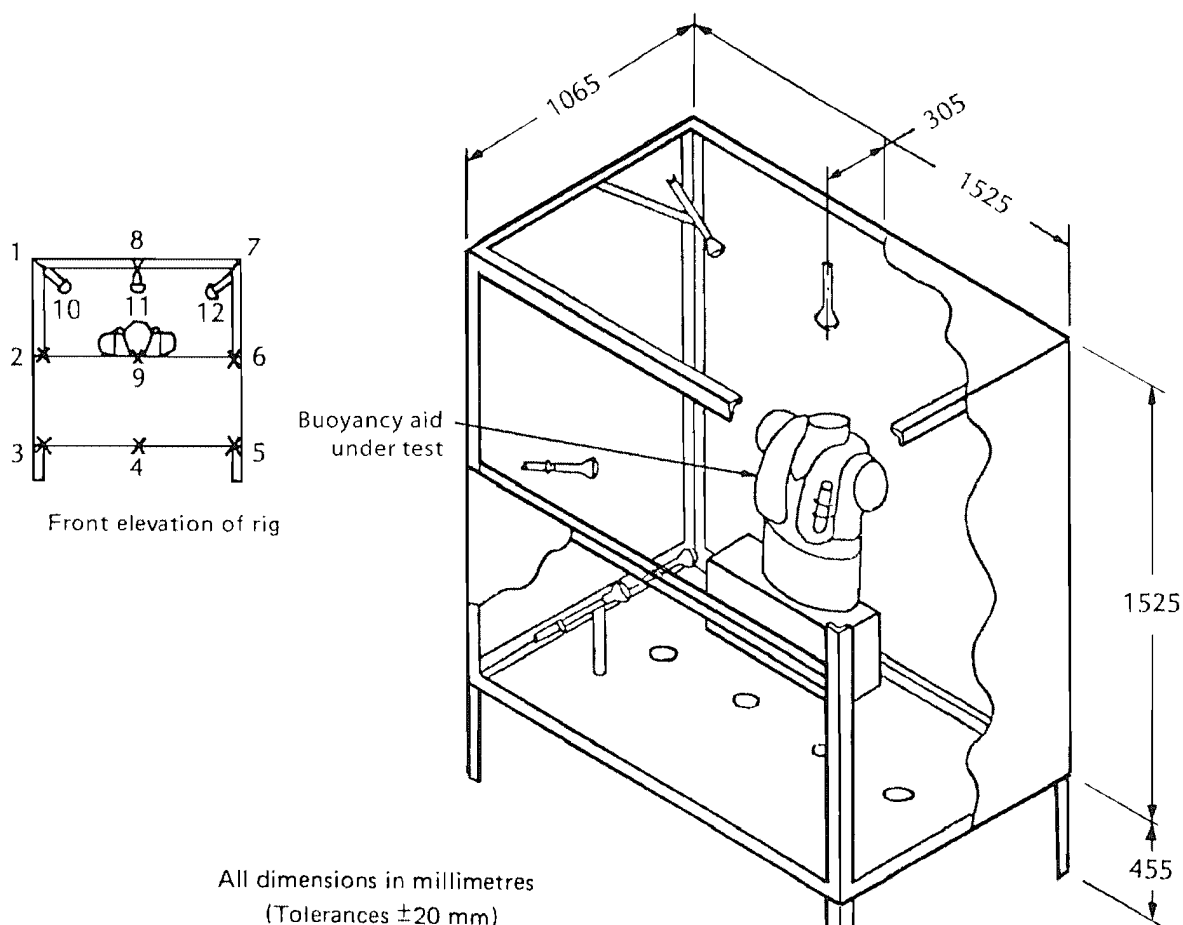


**Figure H1 – Apparatus for testing automatic inflation devices
(illustrating application of test to a buoyancy aid)**

H3 PROCEDURE

The buoyancy aid shall be so placed in the box that the operating head is approximately in line with spray No. 9. Buoyancy aids designed to be worn on the body shall be mounted on a suitable test dummy. All the jets shall then be turned on and allowed to remain on for 15 min $\pm$ 30 s.

H4 REPORT

The report shall state whether or not the automatic inflation device operated.

APPENDIX I

METHOD OF TEST FOR ORAL INFLATION DEVICE

(Normative)

I1 SCOPE

This Appendix describes the method for testing the rate of inflation of an oral inflation device.

I2 APPARATUS

The following apparatus is required:

- (a) The apparatus shown in figure I1. This consists of a pressure control valve of a suitable type which is connected to an air pressure supply. To the low-pressure side of the control valve a tube is connected with a "tee" junction at a suitable point to enable a water manometer to be connected as shown. An air flowmeter is supplied capable of measuring the flow readings in the order of $0.17 \text{ m}^3/\text{min}$. The tubes provided for fitting between the pressure control valve and the air flowmeter should be not less than 12.5 mm bore;
- (b) Suitable connectors to form an airtight seal between the tubes and the oral inflation device.

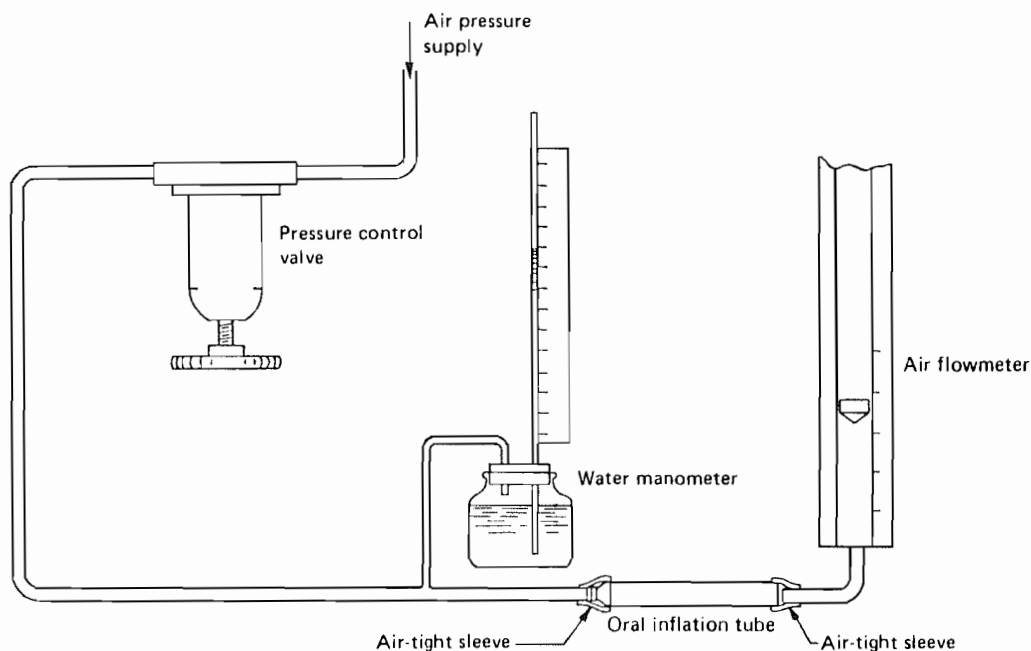


Figure I1 – Apparatus for flow measurement of oral inflation device

NOTE – The flowmeter illustrated is the variable orifice type. Other types may be necessary to obtain the required test accuracy.

I3 PROCEDURE

The procedure shall be as follows:

- (a) Remove the oral inflation device from the buoyancy aid and mount it in the rig between the water manometer connection and the air flowmeter. The mouthpiece of the device should be towards the pressure control valve;
- (b) Turn on the air supply and adjust the pressure control valve to give a water manometer reading of $7 \pm 0.35 \text{ kPa}$. When steady conditions are reached, observe the reading of the air flowmeter;

- (c) Slowly reduce the pressure in the system by means of the pressure control valve until the non-return valve in the oral inflation device operates. (This will be observed from the air flowmeter which should suddenly register zero.)

I4 REPORT

The following shall be reported:

- (a) The reading of the flowmeter ± 5 %, when steady conditions are reached in I3(b) above.
- (b) The pressure ± 5 % at which the non-return valve of the oral inflation device operates.

APPENDIX J
METHOD FOR TESTING STRENGTH OF ATTACHMENT OF
MECHANICAL INFLATION HEADS
(Normative)

J1 SCOPE

This Appendix describes the method for testing the strength of attachment of the inflating mechanism on a buoyancy aid.

J2 PROCEDURE

The buoyancy aid shall be mounted on a dummy and be fully inflated. A steady force of 445 ± 10 N shall be applied to the operating head as near as possible to the point where it enters the buoyancy chamber. The angle at which the force is applied shall be varied continuously throughout the test period. The force shall be maintained for $5 \text{ min} \pm 30 \text{ s}$, after which time the buoyancy aid shall be examined for evidence of damage.

J3 REPORT

The report shall state whether or not the buoyancy chamber or chambers are deflated.

APPENDIX K

METHOD FOR EXPOSURE OF BUOYANCY AIDS TO KEROSENE

(Normative)

K1 SCOPE

This Appendix describes the method for exposing a buoyancy aid to kerosene.

K2 APPARATUS AND REAGENTS

The following apparatus is required:

- (a) A tank large enough to contain sufficient kerosene in which to submerge the buoyancy aid;
- (b) A rig with suitable lifting tackle for positioning the buoyancy aid under test, in, or out of the tank;
- (c) Weights for weighing the buoyancy aid, or other method for ensuring complete submersion of the buoyancy aid;
- (d) An adequate volume of commercial grade kerosene.

K3 PROCEDURE

The procedure shall be as follows:

- (a) Add kerosene to the tank to a depth that will permit the buoyancy aid to be completely submerged;
- (b) Lower the aid, suitably weighted, into the kerosene until it is completely submerged, care being taken not to entrap air. Brush off any adhering air bubbles;
- (c) After $6 \text{ h} \pm 15 \text{ min}$ raise the buoyancy aid out of the kerosene and leave to dry out for $48 \pm 1 \text{ h}$;
- (d) Visually inspect the exterior of the buoyancy aid for signs of deterioration.

K4 REPORT

Any signs of deterioration shall be reported.

APPENDIX L
IN-WATER PERFORMANCE TESTING OF BUOYANCY AIDS
(Normative)

L1 SCOPE

As buoyancy aids perform slightly differently when worn by different people, pass or fail tests involving factors such as “righting” times can be misleading. Consequently, this Appendix describes the method for testing the in-water performance of buoyancy aids. This test is applicable to all categories of buoyancy aids. (Refer to table L1).

L2 APPARATUS

L2.1 Requirements

The following are required for testing purposes:

- (a) A suitably sized fresh water pool. Consideration should be given to using a wave pool where this is available as this better represents the conditions a wearer is likely to experience.;
- (b) At least six human subjects, half of whom shall be female and half male. These subjects shall represent, as far as is practicable, a variety of weights within the appropriate range, and a variety of heights and body builds (refer to L5).
- (c) The buoyancy aid to be tested.

L3 PROCEDURE

L3.1 Test buoyancy aid

L3.1.1 Donning

The donning procedure shall be carried out:

- (a) The buoyancy aid shall be donned by the subject over swimming costumes;
- (b) The test subject shall be handed the test buoyancy aid and requested to “Don and secure a snug fit as quickly as possible”;
- (c) The test subject shall then be asked to “Remove the buoyancy aid as quickly as possible”.

L3.1.2 In-water performance

The following steps shall be carried out:

- (a) All belts and fastenings on the buoyancy aid shall be closed and adjusted to a snug fit;
- (b) Security of fit. The test subject shall enter the water, feet first with arms raised overhead, by stepping forward from the edge of the pool;
- (c) Swimming. The test subject shall then swim in an overarm manner for a period sufficient to determine the effect of a buoyancy aid on this action;
- (d) Flotation. The test subject shall then float slightly back from vertical (initially using the side of the pool for support if necessary), and then with the arms at the sides and the body and head completely straight, once stabilized shall remain passive for at least 30 s;

- (e) Righting motion. The wearer shall then take three gentle breaststrokes in a face down position, and while still face down, relax completely while exhaling slowly. The buoyancy aid should turn or roll the wearer and stabilize the wearer in a backwards inclined position. Timing is to begin from the completion of the last breaststroke, and end immediately the wearer's respiration is no longer impeded.

L3.1.3 Repeat

Action (d) and (e) shall be repeated four further times.

L4 TEST REPORT

L4.1

The following results shall be reported for the test buoyancy aid:

- (a) The time taken to don the buoyancy aid and to remove it and whether this was easily achieved;
- (b) Whether the belts and fastenings were able to be closed and adjusted to a snug fit;
- (c) Whether the buoyancy aid was grossly displaced when the wearer jumped into the water;
- (d) Whether the wearer's ability to swim was seriously restricted;
- (e) Whether the buoyancy aid tilted the wearer forward;
- (f) Whether the buoyancy aid brought the wearer's mouth clear of the water with the time taken to do so;
- (g) Whether the wearer was stabilized in a backwards inclined position;
- (h) Whether the buoyancy aid while inclining the wearer in a backwards position:
 - (i) Rode up to cause excessive discomfort to the wearer or impeded the wearer's respiration, or created the potential to continue up over the wearer's head
 - (ii) Held the wearer's nose and mouth clear of the water
 - (iii) A fail should be recorded if any subject does not meet the requirements of the prescribed in-water tests.

**L5 GUIDELINES FOR NUMBER OF SUBJECTS FOR
IN-WATER PERFORMANCE TESTING OF BUOYANCY AIDS**

L5.1 In-water performance

Number of subjects required to demonstrate compliance with Appendix L: a minimum of six subjects per body mass range shall be tested.

Where there is more than one size within a body mass range as determined by the Standard, the following should be conducted:

- (a) Six subjects, including at least one at each end of the size range, tested in the smallest size;
- (b) At least two subjects tested in each other size, one at each end of the design size range;
- (c) All subjects must be of the appropriate body size for which the jacket has been designed;
- (d) Should there be three sizes within a weight range, the applicant will need to arrange for a minimum of eight subjects. Realistically the top end of the small size could qualify to fit the bottom end of the medium size and the top end of the medium qualifies for the bottom end of the large (see example below).

Example:

Adult small	Subjects 1, 2, 3, 4, 5, 6
Adult medium	Subjects 6, 7
Adult large	Subjects 7, 8

Should there be more than three sizes within a weight range, the process should be extrapolated to include the extra number of sizes.

Table L1 – Summary of applicable clauses for performance tests for buoyancy aids

Clause		Type of buoyancy aid to which clause applies			
		Open-waters lifejackets	In-shore waters PFD	Specialist PFD	Buoyancy vest, buoyancy garments, buoyancy aid wet suit
L2	Apparatus				
L2.1	Required for testing				
(a)	Fresh water pool	✓	✓	✓	✓
(b)	Six human subjects	✓	✓	✓	✓
(c)	Reference buoyancy aid	✓	✓	✓	X
(d)	Test buoyancy aid	✓	✓	✓	✓
L3	Procedure				
L3.1	Test buoyancy aid				
L3.1.1	Donning				
(a)	Donning over attire	✓	✓	✓	✓
(b)	Donning	✓	✓	✓	✓
(c)	Removal	✓	✓	✓	✓
L3.1.2	In-water performance				
(a)	Belts and fastenings	✓	✓	✓	✓
(b)	Security of fit	✓	✓	✓	✓
(c)	Swimming	✓	✓	✓	✓
(d)	Flotation	✓	✓	✓	✓
(e)	Righting motion	✓	X	X	X
L3.1.3	Repeat	✓	✓	✓	X
L4	Test report				
L4.1	Results – test buoyancy aid				
(a)	Donning time	✓ Max. 30 sec	✓ Max. 30 sec	✓ No Max.	✓ No Max.
(b)	Belts and fastenings	✓	✓	✓	✓
(c)	Security of fit	✓	✓	✓	✓
(d)	Swimming	✓	✓	✓	✓
(e)	Flotation	✓	✓	✓	✓
(f)	Righting motion	Max. 5 sec or "reference"	X	X	X
(g)	Backwards inclined position				
(i)	Ride up	✓	✓	✓	X
(ii)	Position of airways	✓	✓	✓	X
✓ – Clause applies		X – Clause does not apply			

NOTE – Max. 30 sec indicates maximum time allowed is 30 seconds.

APPENDIX M
METHOD OF TEST FOR NON-MAGNETIC PROPERTIES
(Normative)

M1 SCOPE

This Appendix describes a method for determining the non-magnetic properties of metal used in safety harnesses and lines.

M2 PROCEDURE

The procedure shall be as follows:

- (a) Place a direct-reading magnetic compass in an undisturbed magnetic area, that is, an area where magnetic items or d.c. electric cables are not continually moved or switched;
- (b) Check the compass to ensure that it has negligible pivot friction. This can be done by deflecting the compass card $10 \pm 1^\circ$ by means of a magnet and then removing the deflecting force when the card should return to within $0.5 \pm 0.1^\circ$ of its original position;
- (c) Present the metal components (with hooks closed) individually to the compass on an approximate E to W line, to a position where the nearest point of the component is 300 ± 10 mm horizontally from the centre of the compass. Lightly tap the compass to eliminate the effect of friction.

M3 REPORTING OF TEST RESULTS

The maximum deflection recorded by the compass as caused by the metal component or components shall be reported.

APPENDIX N

PALM AND NEEDLE WHIPPING

(Informative)

N1 SCOPE

This Appendix describes palm and needle whipping which is an accepted method of securing the tails of rope.

N2 PROCEDURE

The procedure shall be as follows:

- (a) Using a length of rot-proofed twine with a large needle, draw under one of the strands and pull the twine through to within 15 mm of the end of the twine;
- (b) Take a number of turns (minimum 8) round the rope against the lay, drawing each well taut. Follow round with the needle between each strand (see figure N1);
- (c) Finish the whipping with a hitch on the last cross lay of twine and draw this back through the strand and cut off short.

NOTE – The tails of the rope may then be trimmed short without fear of un-laying.

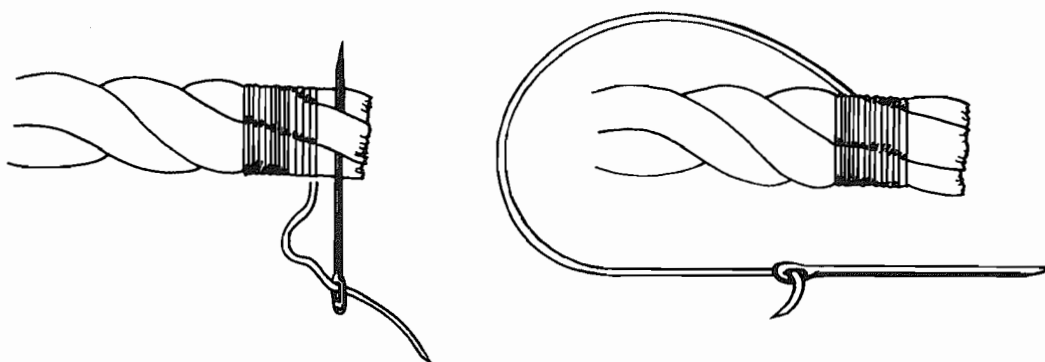


Figure N1 – Illustration of palm and needle whipping

APPENDIX O
RECOMMENDATIONS FOR RECORD KEEPING, STORAGE, EXAMINATION
AND MAINTENANCE OF SAFETY HARNESSES AND SAFETY LINES
(Informative)

O1 RECORDS

A record should be kept for each harness and particulars of all examinations and other items of interest recorded.

O2 STORAGE

O2.1

Harnesses should be stored in a cool dry place and not subjected to direct sunlight. It is recommended that such storage be in properly designed cabinets which allow ventilation, and that equipment be returned to such storage immediately after use.

O2.2

Provision for storage should be such as to ensure that no part of the equipment is subjected to unnecessary strain or pressure or too excessive heat or humidity, and that the equipment is kept free from contact with sharp implements, corrosives and other possible causes of damage.

O3 EXAMINATION

O3.1

To provide the maximum degree of safety for wearers, it is essential that all harnesses are thoroughly examined periodically by a competent person, and any showing a defect should be withdrawn from service immediately.

O3.2

During the examination particular attention should be directed to the following points:

- (a) Webbing – Examine for cuts, cracks, tears or abrasions, undue stretching and damage due to deterioration, contact with heat, acids or other corrosives;
- (b) Snap hooks – Examine for damaged or distorted hooks or faulty springs;
- (c) Buckles – The tongues should be carefully examined where fitted to the shoulder of buckles; inspect for open or distorted rollers;
- (d) Sewing – Examine for broken, cut or worn threads;
- (e) Ropes – Examine for any damage or signs of wear, such as interstrand wear, unravelling extension and fusion.

It should be impressed upon the wearers that their lives depend upon the continued efficiency and durability of their safety equipment and that by frequent personal inspections the possibility of accidents will be reduced to a minimum.

O4 MAINTENANCE

O4.1

Harnesses should be cleaned and examined regularly. The frequency will depend upon the conditions under which the equipment is used, but in any event should not be less than every three months.

O4.2

The following procedure should be followed:

- (a) Wipe off all surface dirt from both sides with a damp sponge. If further cleaning is necessary, rinse out the sponge and work up a thick lather with a good quality soap. Wash the entire harness with the lathered sponge but avoid getting soap into the adjustable buckles. Rinse with clean, fresh water. Remove surplus moisture with a cloth and allow to dry naturally, not in front of an open fire or other source of heat and not in direct sunlight;
- (b) If there are any heavy deposits of creosote or grease on the harness these may be removed with a dilute solution of heavy duty detergent cleaner and water. The diluted liquid should be worked into the fabric with a brush, then rinsed off with clean water. The harness should then be wiped as dry as possible and allowed to dry naturally, not in front of an open fire or other source of heat and not in direct sunlight.

When the equipment is dry carry out a thorough examination as detailed in O3.

APPENDIX P
BURSTING FORCE TEST
(Normative)

P1 SCOPE

This Appendix sets out a method for determining the bursting force of textile fabrics. The method uses a tensile machine based on the constant rate of extension principle.

P2 PRINCIPLE

A test specimen of fabric is firmly held in a clamping device and the force required to rupture the fabric with a metal ball is measured.

P3 APPARATUS

P3.1 Conditioning facility

Means of providing and maintaining a standard atmosphere as described in AS 2001.1.

P3.2 Force application device

A constant rate of extension tensile testing machine (CRE) as follows:

- (a) The machine shall comply with the requirements of Grade B machines as specified in AS 2193;
- (b) The machine shall include a dial, scale or chart, for clearly and continuously indicating the force applied to the test specimen;
- (c) The selected range of the machine shall be such that the force required to rupture the test specimens shall be not less than 20 % of the selected range of the machine;
- (d) The force shall be applied by the machine as a constant rate of extension of the test specimen;
- (e) The force measuring mechanism of the machine shall be such that little or no movement other than the controlled rate of extension shall occur.

P3.3 Ball burst attachment

The CRE machine shall have an attachment fitted consisting of the following:

- (a) A polished steel ball 25.0 ± 0.1 mm in diameter which replaces one of the jaws of the CRE machine;
- (b) A clamping device consisting of 2 annular rings of an internal diameter of 45.00 ± 0.25 mm, which replaces the other jaw. The faces of the rings shall be perpendicular to the direction of the application of the force. Suitable packing materials or embedding techniques shall be used whenever necessary to prevent test specimens slipping in the ring clamps.

P3.4 Water bath

A container in which specimens can be immersed in water at a temperature of 20 ± 5 °C prior to wet testing.

P3.5 Water

Distilled or deionized water for wetting specimens prior to wet testing.

P3.6 Wetting agent

Wetting agent or surfactant of the non-ionic type to assist in the wetting of specimens prior to wet testing.

P4 SAMPLE AND TEST SPECIMENS

Care should be taken to ensure that the operator's hands are dry. Excessive handling of the sample and test specimens should be avoided.

P4.1 Sample

The sample shall be selected from the outer covering of the buoyancy aid.

P4.2 Conditioning

Condition the fabric sample in accordance with AS 2001.1. Prepare test specimens from the sample and conduct subsequent testing without removal from the standard atmosphere.

P4.3 Test specimens

Cut 10 specimens, of any shape but of sufficient size to protrude outside the annular clamping rings around the complete circumference.

P4.4 Wet test specimens

P4.4.1

Place the specimens, already prepared, (see P4.3) in the water bath containing distilled or deionized water at 20 ± 5 °C and allow them to sink under their own weight. Alternatively, the specimens may be forcibly immersed for 1 h.

P4.4.2

In the case of fabrics normally resistant to wetting, add to the water a wetting agent or surfactant of the non-ionic type at a concentration of 1 g/L. Specimens wet in this manner shall be rinsed in distilled or deionized water prior to testing.

P4.4.3

Specimens shall be inserted in the jaws of the machine within 1 min of removal from the water.

P5 PROCEDURE

The procedure for each test specimen shall be as follows:

- (a) Testing shall be carried out in the standard atmosphere for testing;
- (b) Place the specimen without tension in the ring clamp with the outer surface uppermost and clamp securely;
- (c) Start the CRE machine and move the metal ball onto the specimen at a rate of 300 ± 12 mm per min. Continue until the fabric bursts.
- (d) Record the bursting force;
- (e) If a specimen slips in the ring clamps, discard the specimen and the result obtained from it and prepare and test a further specimen, preferably from an adjacent area of the sample;
- (f) After 5 results with the outer surface uppermost, test 5 more specimens with the inner surface uppermost.



P6 CALCULATION AND EXPRESSION OF RESULTS

Calculate the mean bursting force for each side, and express the results to the nearest newton.

P7 TEST REPORT

The following information shall be reported:

- (a) Mean bursting force for each side, in newtons;
- (b) Individual results;
- (c) Indication that the test was carried out with wet specimens.

APPENDIX Q**CAUTIONARY AND CARE INFORMATION FOR INCLUSION ON SWING-TAGS**

(Normative)

Q1 GENERAL

A buoyancy aid helps the wearer to float with their head above the water. There are three different standards for buoyancy aids according to the level of protection afforded to the wearer. Refer to the Maritime Safety Authority of New Zealand as there are regulations covering the number and type of buoyancy aid which must be carried aboard pleasure boats.

Each buoyancy aid will have a number of 'caution' statements printed on the garment. Please take the time to read these as they will provide additional advice in relation to what the buoyancy aid is capable of doing, and what it is not.

Q2 CAUTIONARY INFORMATION

A buoyancy aid will help a wearer to float in water, but it cannot guarantee safety and ultimate rescue. The following points should be remembered:

- (a) Buoyancy aids are manufactured in a range of sizes to suit people of different body masses and builds. Ensure that your buoyancy aid is a good fit and does not ride up in any way that impairs the performance of the device;
- (b) The effectiveness of a buoyancy aid is considerably reduced in rough water, breaking seas and surf;
- (c) In the event of a swamping or capsize, remain with a craft as this will be more easily found by rescue services;
- (d) The chilling effect of submersion in cold water for an extended period (hypothermia) saps the body's reserves of strength and can ultimately be fatal. Wearing a wetsuit or a woollen jumper next to the skin helps insulate the body in the water. Adopting a foetal position in the water reduces the loss of heat through the arms and legs;
- (e) Wear a buoyancy aid at all times or, if this is not practicable, store it in a readily accessible place. When taking guests aboard a boat ensure that there are sufficient buoyancy aids for everybody and that everybody knows –
 - (i) Where to find their buoyancy aid
 - (ii) How to put their buoyancy aid on, and
 - (iii) How to enter the water while wearing their buoyancy aid.

NOTE – For a buoyancy aid other than the waistcoat type, the device should be held down when jumping and entering the water. It is recommended that this technique be practised in a non-emergency situation.

Q3 BUOYANCY AIDS AND CHILDREN

A child is difficult to float in a face up position because of the distribution of body mass and because a child tends to panic in an unfamiliar environment. The violent movement of the arms and legs in an attempt to 'climb out' of the water tends to nullify the stability of the buoyancy aid. A properly designed buoyancy aid of the correct size should hold a child's mouth and nose clear of the water. A child should be taught how to put on the device and should be allowed to try it out in the water. It is important that the child feels comfortable and knows what the buoyancy aid is for and how it functions. Parents should note, however, that a buoyancy aid is not a substitute for competent supervision.

Q4 CARE OF BUOYANCY AIDS

Proper care of buoyancy aids is essential if they are to perform their intended function in an emergency.

The instructions supplied by the manufacturer should be followed.

Buoyancy aids should be inspected regularly. The inspection should determine that the outer covering, where applicable, is intact with particular attention being given to seams.

Fastening devices should be inspected for security of attachment and correct operation, and for freedom from corrosion.

Inflatable buoyancy aids should be inspected for soundness and cylinders inspected. If cylinders are rechargeable they need to be hydrostatically tested.

Buoyancy aids should be kept clean. Warm soapy water is the most suitable cleaning agent. The manufacturer's instructions regarding the use of solvents must be observed as solvents will have an adverse effect on the performance and labelling of the buoyancy aid.

Q5 MISUSE OF BUOYANCY AIDS

Buoyancy aids should be used only for the purpose for which they are designed. They should not be used as fenders, and except for buoyancy cushions, they should not be used for cushions and other such purposes.

Q6 STOWAGE AND STORAGE INFORMATION

When not being worn, buoyancy aids should be ready to hand.

When the vessel is not in use, buoyancy aids should be stowed out of the weather, in a dry, well-ventilated position, not in direct sunlight and away from any direct heat source.

They should be stowed away from harmful chemicals such as battery acid, fuels and oils.

They should not be subject to misuse by floating in bilges or sliding or rolling with the vessel's motion.

If wet, they should be dried before being stowed away.

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